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JANUARY 1999

CQ

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Antenna Weather at K3WW, Perkasie, PA

RADIO AMATEUR'S JOURNAL

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CQ Amateur Radio

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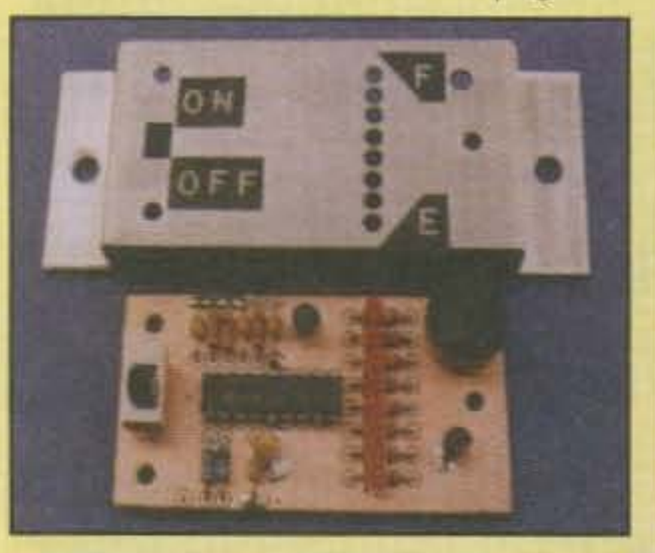

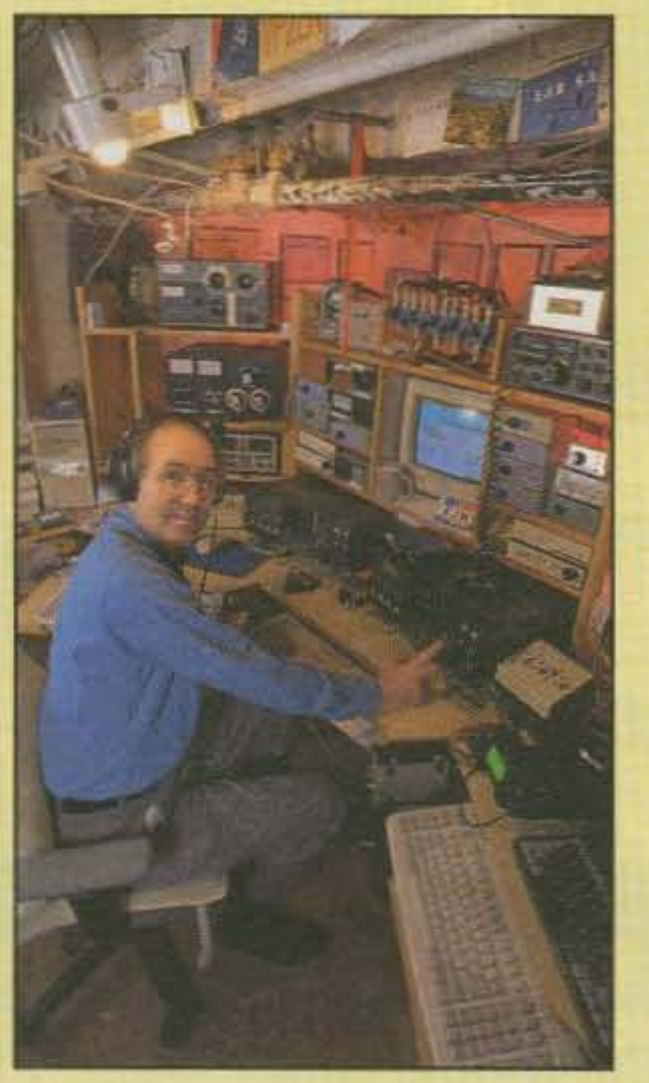

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ON THE COVER: The snow is on the ground, there's a nip in the air, and the sky is as blue it gets. Sounds like perfect antenna weather to me! Now, we all have those noble plans to tend to our antenna farms on those bright Spring days, or on those sultry Summer weekends, but let's be honest, guys and gals: Doesn't it seem as if more actual antenna work gets done on the sort of January day we see on this month's cover? This striking QTH is the home of Charles Fulp, Jr., K3WW, in Perkasie, Pennsylvania. That's Charles at the rig in the photo to the left, by the way. (Photo by Larry Mulvehill, WB2ZPI)

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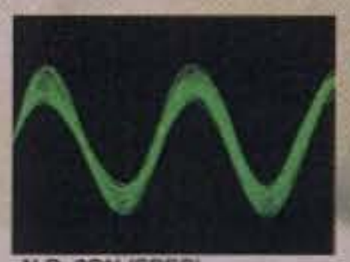
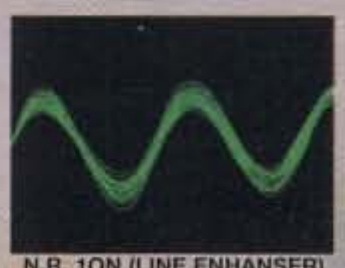


N.R. 2ON (SPEC)
SINAD=25dB



N.R. 1ON (LINE ENHANSER)
SINAD=18dB

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The **Extensive Memory Functions** provide a bank of 100 memory positions split into 90 standard channels for general operation and 10 for programmable VFO, programmable scan and long-term memory. Memory contents can be scrolled, copied or locked out. In addition there are **5 quick memories** for storing frequencies and modes on the fly, perfect for the busy DX contester.

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ZERO BIAS

AN EDITORIAL

It's a new year with new opportunities, both to excel and to put our foot in our mouth. It's a clean slate on which we can write things new and erase things old. It's our New Year's resolutions hastily made and quickly broken that set the tone for the rest of the year, except that we're all a year older and maybe not quite as much wiser.

So much for waxing about something that hasn't occurred as of yet. As I write this, people are still dissecting the recent elections and wondering what happened to their grand plans and strategies. Apparently, atavism doesn't carry much weight in politics.

Well, it would seem that the G.O.P. shares some qualities with our Grand Old League. They both have preached to a hard-core choir of their constituents and both seem continually amazed when younger, less zealous, more pragmatic people fail to rally around the flag. Overall, the message of the G.O.P. and the G.O.L. isn't bad. It isn't evil, and in fact it has many good points. What it isn't is a paragon of inclusiveness or equality. Our G.O.L. generally talks down to those very people it seeks to attract, sorely lacks in membership, and essentially needs for a progressive future.

With our G.O.L. it's nothing new. It probably started with the advent of the Novice license and deepened with the Technicians. The schism with the "poor unfortunate" 28,000,000-plus CBers who had the audacity to stand alone and not accept the burden of second-class citizen is impossible to bridge. So, for almost 50 years that I'm aware of, that G.O.L. of ours has kept the message pure, the ramparts guarded, and the thinning gray (or balding) line safe. The Continuous Wave is still continuous and long may it chirp.

In November I had the temerity to actually praise our G.O.L., and especially Rod Stafford, W6ROD, for their brave and outstanding attempt to bring amateur radio and the League into the 20th (almost 21st) century. I still think that basically it's a good idea and long overdue. Well, it didn't take too long for the harridans among us to let me know, partake of, and simply enjoy a piece of their minds. No, none of it was delivered via a CW traffic net, nor the tried and true amateur radio message forms (you know, the yellow and green pads you used to be able to buy). We have the collective benefit of e-mail these days, where the "e" stands for "execration." Letting loose with invectives usually doesn't do too much to win friends and influence people. The only dumbing down I see these days is from people who refuse to see and take part in reality. It's simple. It's easy. It's a fact. And we're never going back to the way it was.

Okay, maybe some of us would like to go back and perhaps try to stuff the cat back in the bag. Right after the CQ WW I received a copy of ARRL Plan #2, which was a report on a special meeting held by the ARRL Board over the contest weekend. While it in essence reaffirms its original position, the Board is already hard at work on subtle modifications. So far, so good. As I read through it, two sentences stuck in my mind as pedantic and condescending claptrap. It is the core or crux of this situation and why we're in it in the first place:

"Board members at the October 24 meeting near St. Louis expressed concern that the leap to HF privileges under the July plan could prove too daunting, especially for younger newcomers. Some also were troubled about the growing gulf between the 'traditional' HF operator and the newer VHF-only amateurs."

I'm sorry, but to me it sounds like we're back in the days of Reconstruction. Our President has freed the slaves, which may or may not have been a good idea, but we really can't extend full suffrage to them yet as they're not emotionally developed enough to vote, or heaven forbid, hold office. I apologize for the analogy. It certainly was not the same thing, but it was the first thing that came to my mind when I read it and it seemed apt. I'm sure I'll get a number of electronic QSLs from Billingsgate for it, but the principle is true. We have a six-tiered caste system that doesn't work. It certainly is separate, but in no way is it equal.

Collectively, we have failed to hold a fellow amateur's license as valid as our own. Collectively, we negate his efforts, his aspirations, and what he enjoys in comparison to our shining example of what amateur radio should be. Unless someone is at the top of tier six, he is to be pitied, castigated, and urged to put out the effort to become "real" and "one of us." I'm sure that some of us could rationalize an eight-tiered system with five levels of CW proficiency to further fractionate our population. We tend to conveniently forget that whatever license class we have, we tend to exhibit the same amateur radio behavior. We do the same things.

However soigne the League's proposal may be, it does in fact leave the two upper tiers (the bulk of their membership) intact and only trifles with the lower end of the caste system (the bulk of the entire amateur radio population). It is the General class, our population's equivalent of the "middle class," that the proposed system will squeeze and devalue. Art imitates life. I suppose the CW issue and not particularly the "dumbing down" issue is the true epicenter of this proposal. In truth, the dumbing-down process, if it is even fair to call it that, happened years ago when technology passed by most of us. The Sisyphean issue that propels us to roll that heavy stone up the hill of public opinion only to have it roll back down on us periodically is CW. We rant and rave (and e-mail) over both sides of the issue about a mode that the majority of us don't use and only learned to pass an exam. Those who do use it, to any degree, enjoy it thoroughly and take great pride in their expertise. It's a wonderful skill, but it doesn't identify who we are these days. If anything, the new tactile eye-hand coordination technique that seems to identify a lot of us is the Internet and e-mail. How much digital information can we get out and receive in a given period of time? We have reinvented the traffic nets, and our rag-chew nets are now reformed as chat rooms. It's not good or bad; it's just the way things are and the most facile way to exchange ideas and information. It's going to be a long time, if ever, before some concerted group petitions the FCC to bring back spark as the real, traditional amateur radio.

We have only one true, continuous tradition. We, the collective we, provide expert, expeditious emergency communications during times of need. We have always done this, at no cost, using whatever equipment we had in our shacks, for as long as the situation required. We have done this, seemingly forever, because no governmental agency nor commercial enterprise has been able to flawlessly do this, whether because of technology or bureaucracy. It's simple. We make it work each and every time. We have the proven ability to provide reliable local and worldwide communications when others can't.

So before we bust a gut or have a stroke over the CW issue and how important it is, ask yourself a few questions. How much time do you actually spend using CW, promoting it, and possibly teaching it? We all know how important it is emotionally to a lot of us, and perhaps to some extent it should be. The next question we have to ask ourselves is how much actual time do we invest, with the same fervor, in participating, promoting, and training for public service? CW will still be a mode even after the last gasp for many of us. The technology we know today will be drastically different in twenty years (or less). Very few of us could even venture a guess as to what the gear will be like then or even what possible new modes will exist. The only thing it's probably safe to bet on is the need for emergency communication and public service. It probably will still be there. What is important is what we do, not how we do it.

73, Alan, K2EEK

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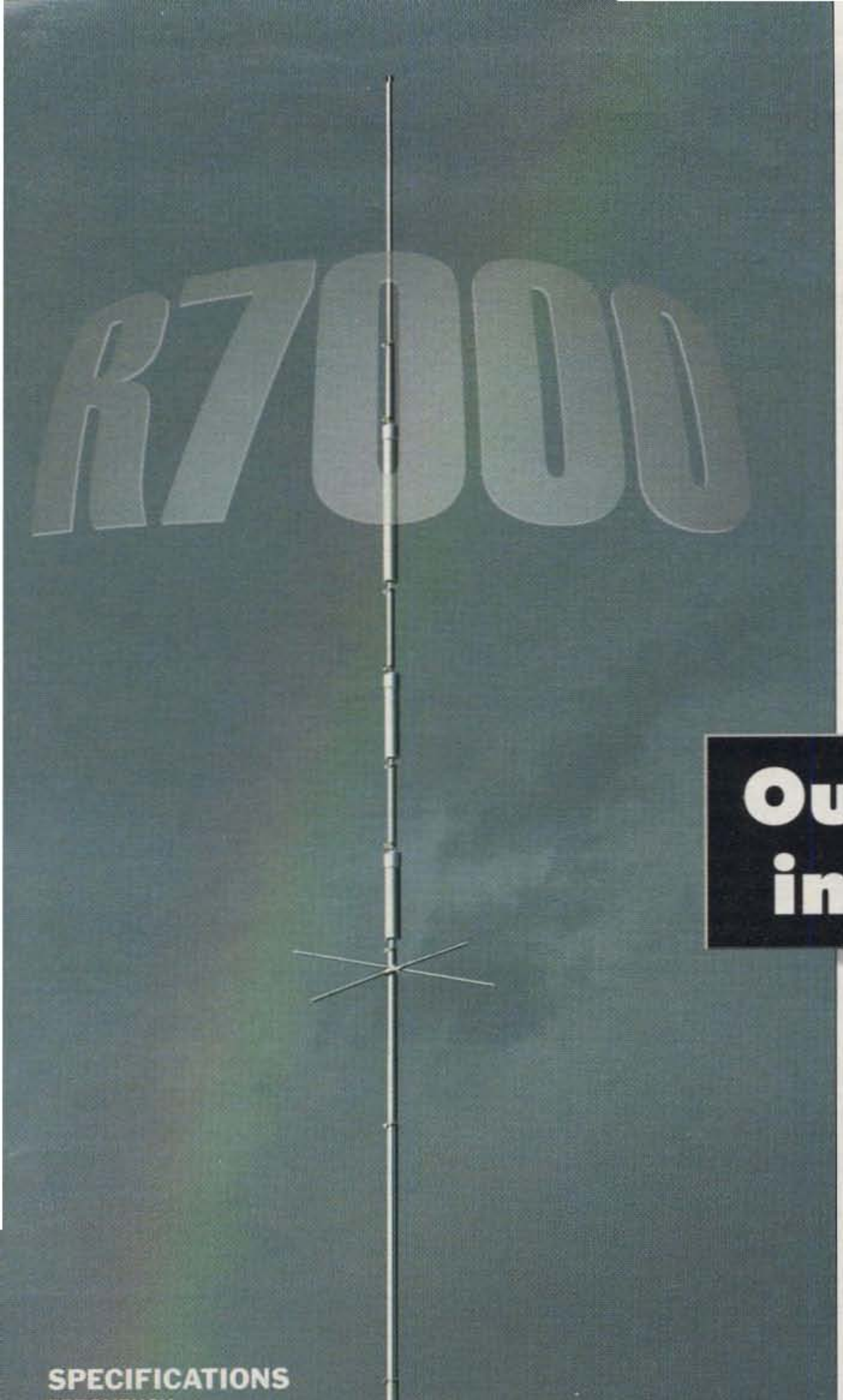

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ANNOUNCEMENTS

Meet the Novices and Technicians Day: Sponsored by YLRL, 1500Z January 9 to 0500Z January 10, 1999, CW and SSB. YLs only, use Novice/Tech HF subbands, 6 meters and 2m/440 MHz (no repeater contacts). Exchange RS(T), name, QTH, license class. 3.676, 7.133, 21.133, 28.176, 28.333. Score 3 points per QSO for each YL Novice/Tech worked; 2 points per QSO for each General or Advanced YL worked; and 1 point per QSO for each Extra YL worked. Final score is total QSO points. Awards available. Send logs postmarked within 30 days of the contest to: Cleo Bracket, KØJFO, 810 Towne Square Drive, Fremont, NE 68025-7000.

Dayton Amateur Radio Association Scholarships: The DARA is now accepting applications for their annual scholarship awards. The program is initially open to any FCC licensed amateur radio operator graduating from high school in 1999. There are no restrictions on the course of study planned by the student, nor does he or she need to be planning on a four-year baccalaureate degree. However, schools awarding associate degress or any technical institution selected must be accredited. The awards will be based on a number of factors including financial need, scholastic achievement, contributions to amateur radio, and community involvement. No single scholarship award will exceed $2,000. To receive an application send an SASE to DARA Scholarships, 45 Cinnamon Ct., Springboro, OH 45066. Deadline for submission of applications is June 15, 1999.

Special Event Station WØK: All amateur radio clubs of St. Louis, Missouri will sponsor station WØK during the Papal visit of Pope John Paul II, January 26–27, 1999. Operations from the Monsanto ARA shack will be on 10–80 meters, 24 hours a day. QSL with #10 SASE via Rev. Mike Dieckmann, KAØIAR, 703 Third St., Hillsboro, MO 63050.

• The following hamfests are scheduled for January and early February 1999:

Jan. 2, **Lakeway ARC Hamfest & Computer Show**, Talley Ward Recreation Building, Morristown, Tennessee. For more information, contact Perry Hensley, N4PH, 423-828-4848, <n4ph@juno.com>; Kemp Lawson, KF4AGB, 423-587-3320, <kemplawson@aol.com>; or Lakeway A.R.C. KF4JJJ, P.O. Box 895, Talbott, TN 37877-0985. (Exams)

Jan. 9, **NCARC Winter Superfest,** Larimer County Fairgrounds, Loveland, Colorado. For information, call 970-352-5304. (Exams)

Jan. 9, **Greenwood Hamfest & Computer Show**, Greenwood Civic Center, Greenwood, South Carolina. Contact hamfest chairman, Frank Kolar, WA9FWO, 104 Rock Creek Dr., Chinquapin Addition, Greenwood, SC 29646-9245, phone 864-229-5639 (day or eves); web: <www.w4gwd.org>. (Exams)

Jan. 9, **West Allis RAC Hamfest/Swapfest**, Waukesha Co. Expo Center Forum, Waukesha, Wisconsin. For more info, contact Phil Gural, W9NAW, 414-425-3649, or P.O. Box 1072, Milwaukee, WI 53201. (Exams)

Jan. 9–10, **Southwest Florida Hamfest**, Ft. Meyers, Florida. Contact Colleen Sammons, KQ4TR, 3667 Kelly St., Ft. Meyers, FL 33901 (941-936-1431, e-mail: <csammons@juno.com>.

Jan. 10, **22nd Annual South Bend Hamfest & Computer Expo**, Century Center, South Bend, Indiana. For more info contact Denny, KA9WNR, Mon.–Fri., 7 PM – 10 PM, 219-291-0252.

Jan. 16, **19th Annual Hammond Hamfest**, University Center on University Drive, Hammond, Lousiana. For more information, contact Southeast Louisiana Amateur Radio Club, Inc., P.O. Box 1324, Hammond, LA 70404. (Exams)

Jan. 16, **Ham Radio & Youth Swap-n-Shop #7**, UAW Local 599 Hall, Flint, Michigan. For more information, call Clay, KF8UI, at 810-233-7889; or e-mail: <clay@iavbbs. com>.

Jan. 16, **9th Annual Northwest Missouri Winter Hamfest**, Ramada Inn, St. Joseph, Missouri. Contact Northwest Missouri Winter Hamfest, c/o Gaylen Pearson, WBØW, P.O. Box 1533, St. Joseph, MO 64502, or e-mail: <wb0w@ibm.net>. (Exams)

Jan. 17, **Richmond Frostfest 99**, The Showplace, Richmond, Virginia. Contact P.O. Box 14828, Richmond, VA 23221-0828 (phone 804-739-2269, ext. FEST; on the web: <http://frostfest. rats.net>).

Jan. 17, **Hazel Park ARC 33rd Annual Swap & Shop**, Hazel Park High School, Hazel Park, Michigan. Contact HPARC, P.O. Box 368, Hazel Park, MI 48030.

Jan. 17, **Metro 70cm Network Giant Electronic Fleamarket**, Lincoln High School, Yonkers, New York. For more information, contact Otto Supliski, WB2SLQ, 914-969-1053. (Exams)

Jan. 17, **SCARFest 99**, Hocking College, Nelsonville, Ohio. For more information, contact Russ Ellis, N8MWK, 740-767-2226.

Jan. 23, **Tennessee Valley Amateur Radio Network Hamfest**, Gallatin Civic Center, Gallatin, Tennessee. For more information, contact Bill, N4SSB, and Patty, KE4CXX, Ferrell, 1253 Woodvale Drive, Gallatin, TN 37066-4051 (615-451-5992). (Exams by preregistration with form 610, copy of license or certificate of completion, and SASE to Ronnie Gilley, 512 Hillside Dr., Gallatin, TN 37066.)

Jan. 24, **Tusco ARC Hamfest**, Ohio National Guard Armory, Dover, Ohio. For more information, contact Howard Blind, KD8KF, 6288 Echo Lake Road NE., New Philadelphia, OH 44663 (330-364-5258).

Jan. 30, **Nevada, Missouri ARC Hamfest**, Vernon Fairgrounds, Nevada, Missouri. Contact Nevada ARC, P.O. Box 567, Nevada, MO 64772 (e-mail: <dkimrey@ipa.net>; on the web: <www.users2.ipa.net/~dkimrey>).

Jan. 30, **Lockport ARA Winter Ham Radio Auction**, Cornell Cooperative Extension, Niagara County Fairgrounds, north of Lockport, NY. Info:<lockport_ara@juno.com> <http://hamgate1.sunyerie.edu/~lara/auction.html>; P.O.B. 1022, Lockport, NY 14095.

Feb. 1, **West Valley ARC Radio Equipment Auction**, St. Clement of Rome Catholic Church Social Hall, Sun City, Arizona. For more information, contact WVARC, P.O. Box 1573, Sun City, AZ 85372 (602-582-8208; e-mail: <w0dno@worldnet.att.net>).

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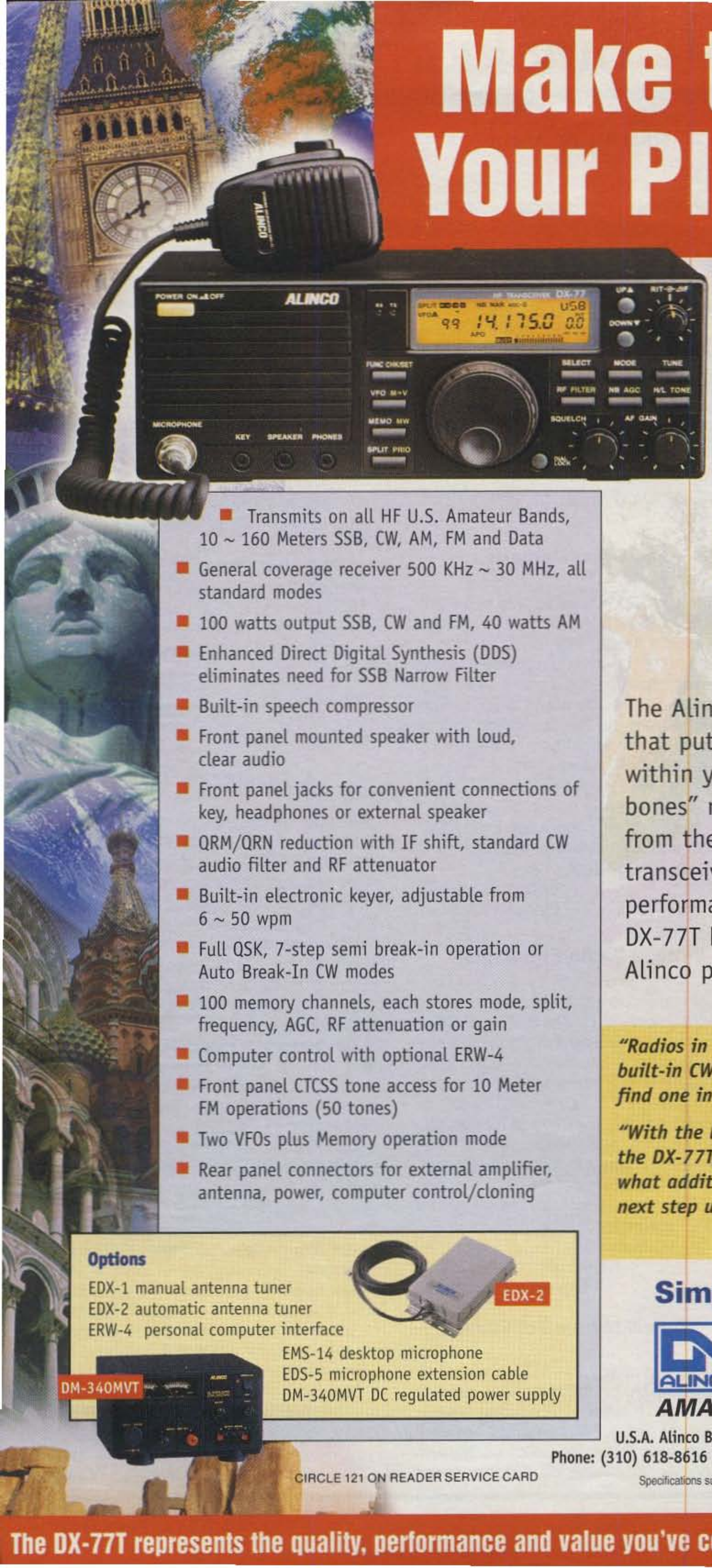

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—QST Product Review, June 1998

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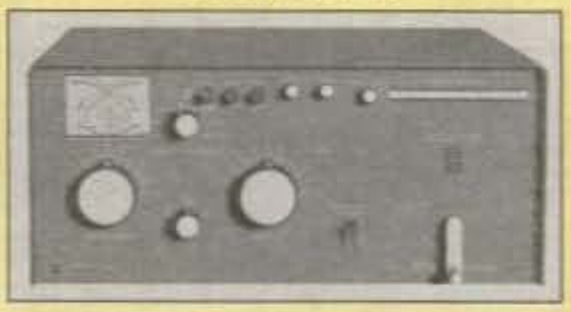

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CIRCLE 88 ON READER SERVICE CARD

OUR READERS SAY

What It's All About

Editor, *CQ:*

Just a note to comment on the October 1998 cover. It sure is good to see "real hams" getting in the limelight. This is the thing that is going to help ham radio grow, not tinkering with license structure or vanity calls, but just promoting the fun of it as a family thing.

I am the only ham in my family. Both my wife and son are interested in it to a point, and seeing things such as other couples and families at their stations does more for their interest than anything else ever has. This is what ham radio is about—"people." Thank you, and I really have been happy with *CQ*. Keep 'em coming!

Jeff Johnson, AA8VE
Clarkston, Michigan

Some Good Memories

Editor, *CQ:*

Your August 1998 issue was excellent. The article about Barry Goldwater brought back some good memories. I had a chance to visit his ham shack, meet Barry, and even received a personal letter from him a few years ago about working with someone from the Navajo Nation to look at some communications problems on their reservation.

I also enjoyed the article on the balloon-lifted full-wave antenna for 160 meters. I hope to see more articles like this in *CQ*.

Keep up the good work. We all are enjoying your magazine!

Bob Wertz, NF7E
Flagstaff, Arizona

Vintage Radio Enthusiast

Editor, *CQ:*

I just wanted to say that I really enjoyed the September cover. Jeff Bishop, W7ID's equipment is exquisite. I'm glad to see that *CQ* magazine is interested enough in us "Vintage Radio Enthusiasts" to take the time to put us on the cover and have articles on the subject within the magazine.

Thanks for a great magazine, and if you have the time, take a look at my web page. I have some pictures of a few of my "old" things at <http://www.communique.net/~kk5fe> (collector of tube radios and vintage fishing equipment).

Keith Heitzmann, KK5FE
Covington, Louisiana

A Few Minutes of Fame

Editor, *CQ:*

It was very enjoyable talking with Dick Ross, K2MGA, on the telephone several weeks ago. It's really nice when people just sort of " click." Susan and I are very pleased with the write-up of us here in Amado, Arizona *(see the October cover and "On the cover" writeup—ed.)*. I have heard from many of our members of the Green Valley Amateur Radio Club complimenting your magazine for recognizing those of us who probably make up the majority of the amateur radio community. I know there are many active contesters, but most of us are just plain old folks who like to chat with other hams. Much of the amateur community lives in retirement communities where there are many restrictions regarding antennas, so they typically are not involved in contesting unless the propagation is extremely good.

I have two brothers who live in Florida, and they were quite excited to learn of Susan's and my 15 minutes of fame. In fact, both of them have indicated that they would like to get their amateur licenses. Maybe seeing their brother and his wife on the cover of October *CQ* will motivate them. My oldest brother, Reg, told me that he reads *CQ* on a fairly regular basis even though he is just a " ham wanna be."

Thanks again for the great magazine and our claim to 15 minutes of fame. It's been fun.

David, AB7VE, and
Susan, KC7TAC, Sader
Amado, Arizona

A Glimmer of Light

Editor, *CQ:*

Having read the October "Zero Bias," I want to comment on your thoughts about the young KF4BIA.

I truly hope that the amateur community realizes that your intent was not to focus on Mr. Paczkowski. Rather, the real message was intended to remind everyone that the words "me, I, and myself" are quickly becoming intolerable traits that amateur radio can do without. CW operator or not, Mr. Paczkowski *does* " . . . exemplify what amateur radio is or should be." Let me outline a thought which all members of the human race should incorporate into the recesses of their primitive thought process: Every one of us has feet which happen to be glued to the same planetary surface. There lies [within each of us] a duty which commands the virtues of kindness, understanding, loyalty, and love. The majority, who unfortunately are inherently silent, will forever retain these qualities. However, this overwhelming group of people will quickly need to learn how to articulate these God-given traits into public forums. The meek will never inherit the Earth if we continue to allow clouds of darkness to control the public podium.

"Zero Bias" served to bring to the podium a glimmer of light which I saw flickering among the clouds of "me, I, and myself."

Craig Spears, WX5DX
Brazoria, Texas

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B-1016-G Great for ICOM IC-706!

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Watts Out	25	50	75	95	100	100+	100+
Watts In	¼	½	1	2	4	6	8

- *100 Watts out with all handhelds up to 8 watts*
- *All modes: FM, SSB, CW*
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Power Curve -- typical B-34-G output power								
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Watts In	1	2	3	4	5	6	7	8

- *35 Watts Output on 2 Meters*
- *All modes: FM, SSB, CW*
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Power Curve -- typical BD-35 output power							
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Watts In	1	2	3	4	5	6	7

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Did you ever notice when reading an antenna article that the conclusions and results take on more weight when the article contains a few antenna pattern graphics? On the other hand, how many of us really know just what information is being displayed and exactly what it means? W4RNL takes the mystery out of antenna patterns and lets us see just what's being measured and how.

How To Get the Most Out of Antenna Patterns—Part I

BY L. B. CEBIK*, W4RNL

These days the amateur radio journals are filled with antenna pattern graphics such as the pair shown in fig. 1.[1] The patterns are supposed to be highly informative about antenna performance. Unfortunately, to the new amateur they can be somewhat bewildering. Even the experienced ham may not be getting from them all the information that is compactly presented in the patterns. Let's start from scratch, seeing how these patterns represent antenna data that is useful to us, whether we plan to buy an antenna or build our own.

Although modern antenna-modeling software produces data that can yield many different kinds of antenna patterns, the most common ones are called **total far field** patterns. They combine all calculated radiation from an antenna in every direction and produce a pattern that is related to a constant strength. In fig. 1, we can see that the pattern bulges and indents. The bulges are called **lobes** and the indentations are called **nulls**.

Hypothetically, if we stand on a line proportional to the pattern line distance from the center point (where the antenna is located), we will receive a radiated signal of constant strength, no matter where on the line we stand. Likewise, if someone moves a transmitter along the line, then the antenna we are using will receive a signal of constant strength, no matter where along the line we place the transmitter. In short, antenna patterns reflect both transmission and reception characteristics of the antenna being patterned, where the lobes indicate stronger signals and the nulls indicate weaker ones.

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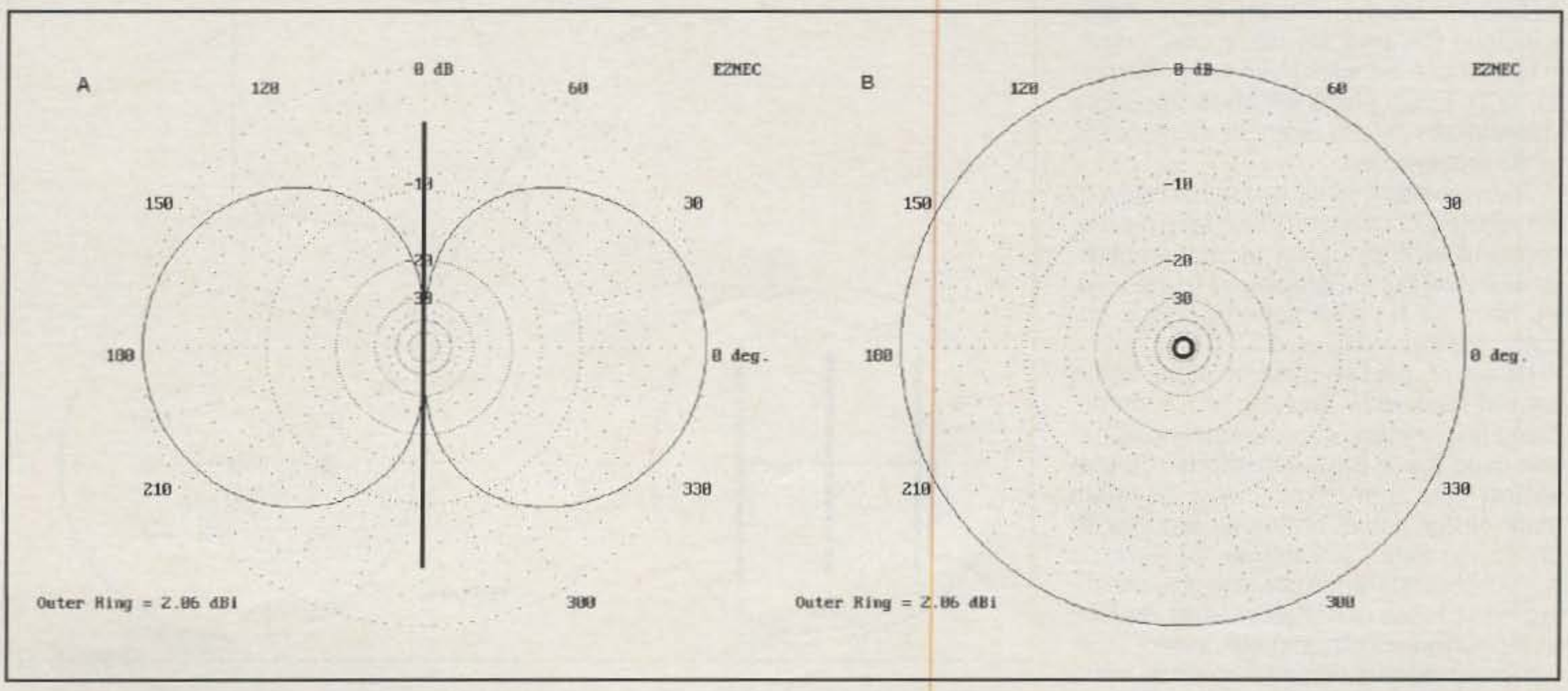

Fig. 1– Free-space azimuth (E-plane) and elevation (H-plane) far-field patterns for the common dipole.

Mastering the art of reading antenna patterns intelligently requires that we learn a number of ideas and conventions. Some relate to antenna theory itself. Some emerge from antenna modeling. Still others come from actually building and testing antennas on carefully constructed ranges. Therefore, our short story cannot end here. However, if we learn to sort out the key factors that are relevant to a particular antenna pattern we encounter, we can read them as easily as the words on this page.

Free Space: A Starting Point For E- and H-Planes

Let's begin in **free space**. Unlike the reflective surface of the Earth, free space is a region in which there is nothing but the antenna. In fact, the patterns in fig. 1 are free-space patterns of a common horizontal, resonant half-wavelength dipole fed at the center. Fig. 2 shows a complete three-dimensional view of the antenna pattern. The antenna is grossly exaggerated in size to clarify its position through the center of the pattern. In reality, it would be too small to be seen.

The first thing to notice is that the pattern is symmetrically even all around the wire when viewed from the wire end. That symmetry shows up in fig. 1(B). However, the radiation is not so even when viewed as a slice through the pattern in the plane of the wire. That's the view shown in fig. 1(A).

The difference between the two patterns reflects a fundamental property of antennas: They emit (and receive) radiation in two planes, conventionally called the **E- and H-planes**. The radiation in the E-plane is parallel with the wire. An antenna pattern taken parallel to the wire is also called an E-plane pattern. If we slice the 3-D pattern at any angle, but always barely include the antenna wire's total length, in free space we will obtain the pattern of fig. 1(A). Every plane will show the same indentations in field strength off the ends of the dipole wires.

There is also radiation at right angles to the wire. By convention, if we take a slice, normally through the center of the antenna element, but at right angles to the wire, we have an H-plane pattern. This is the pattern of fig. 1(B).

However, the two patterns in the figure are not marked E- and H-plane. Instead, they carry a more conventional designation used these days—**azimuth** and **elevation**. We use these terms because most of our actual antennas are placed above the earth, and the planet gives us a nearly flat reference plane to give meaning to the ideas of horizontal and vertical, and also to azimuth and elevation.

When we have more complex antenna arrays, the E-plane and H-plane patterns become even more rigorous (see fig. 3). Here we have a 3-element Yagi. The E-plane not only parallels the length of the main element, it also passes through the plane formed by the three elements. The H-plane is at right angles and is normally centered on the driven element, to which is connected the signal source. The elements of this antenna form a horizontal line across the H-plane.

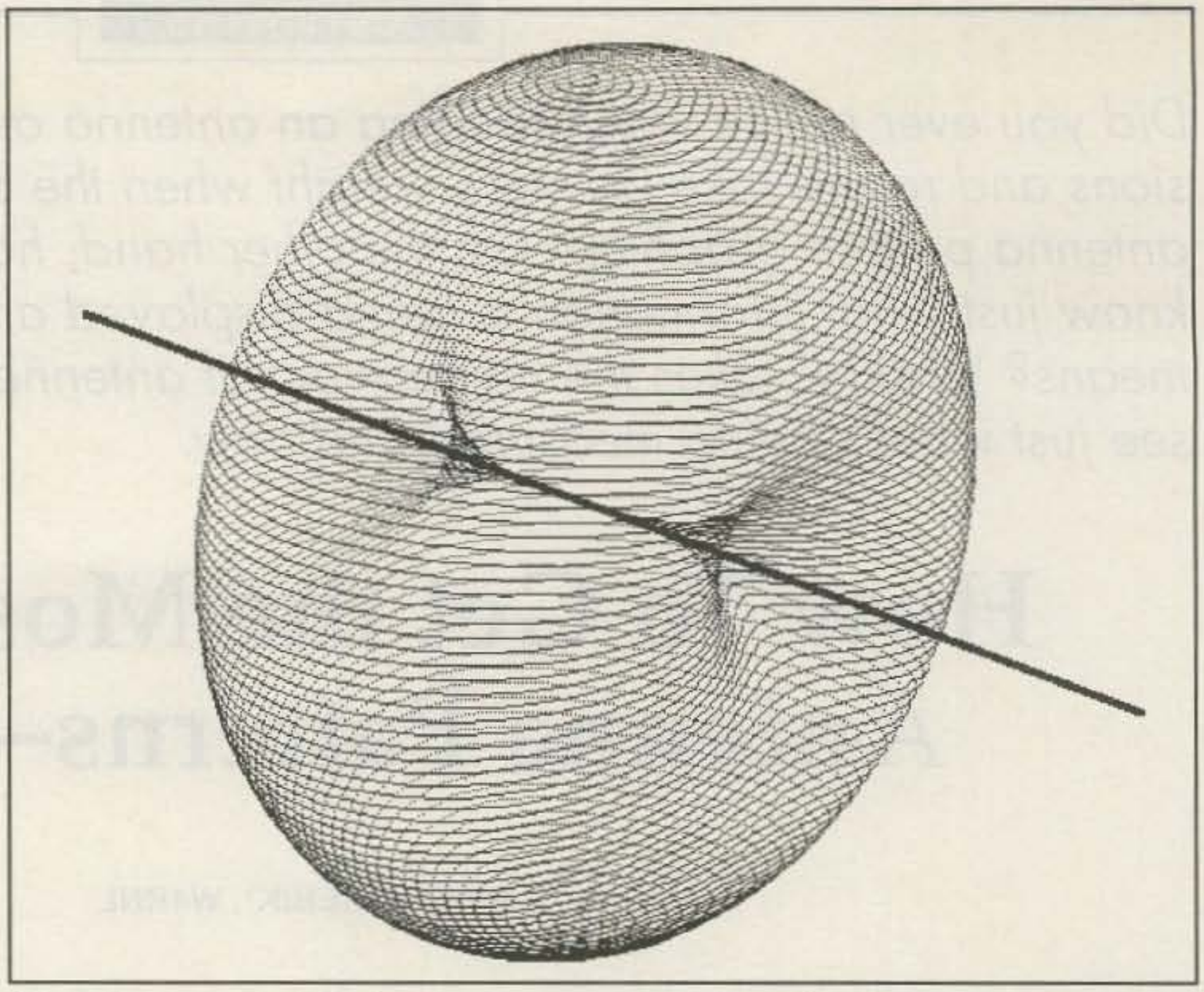

Fig. 2– The common dipole (greatly exaggerated in length) with its three-dimensional far-field pattern in free space.

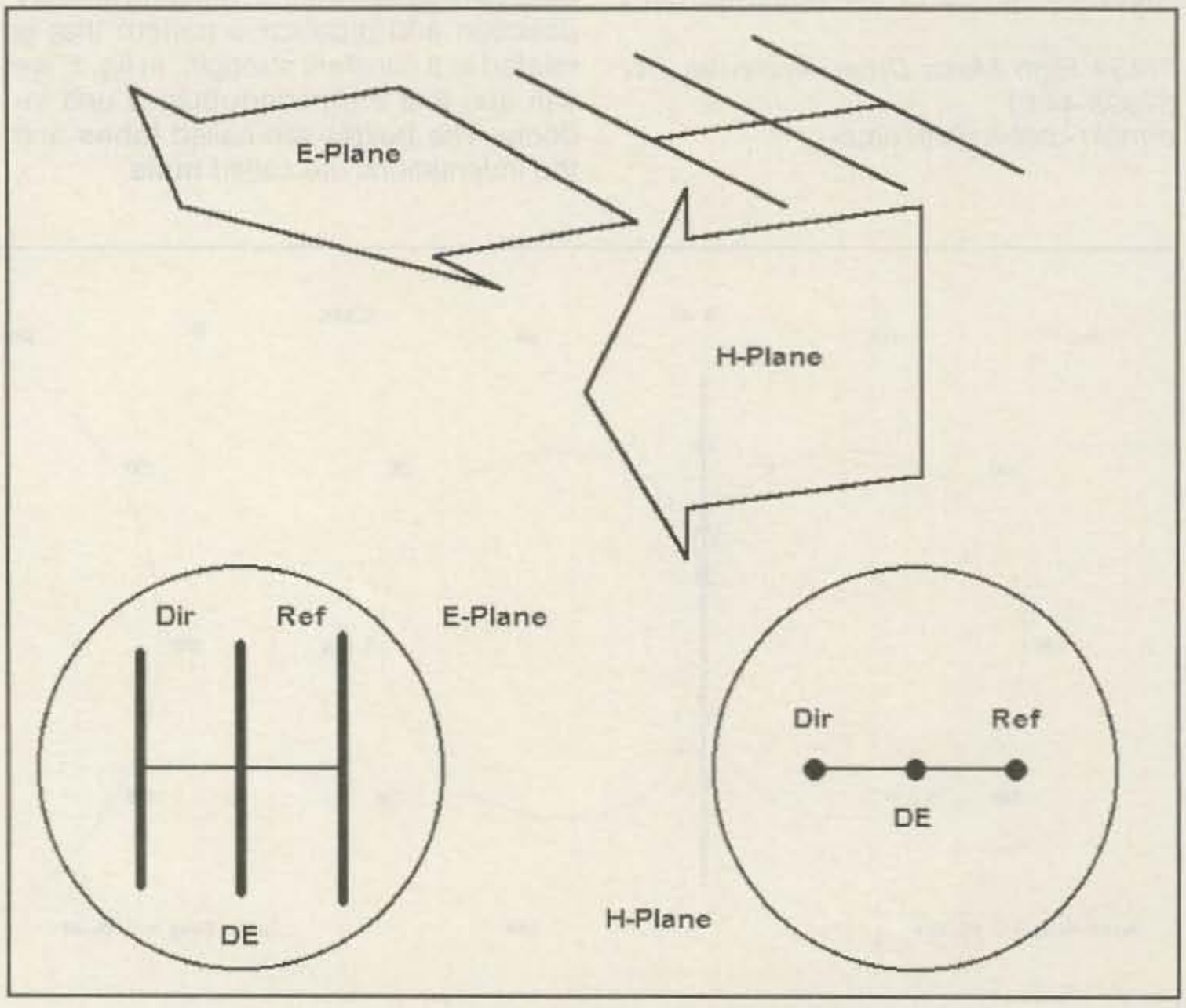

Fig. 3– Free-space E-plane and H-plane views of a 3-element Yagi.

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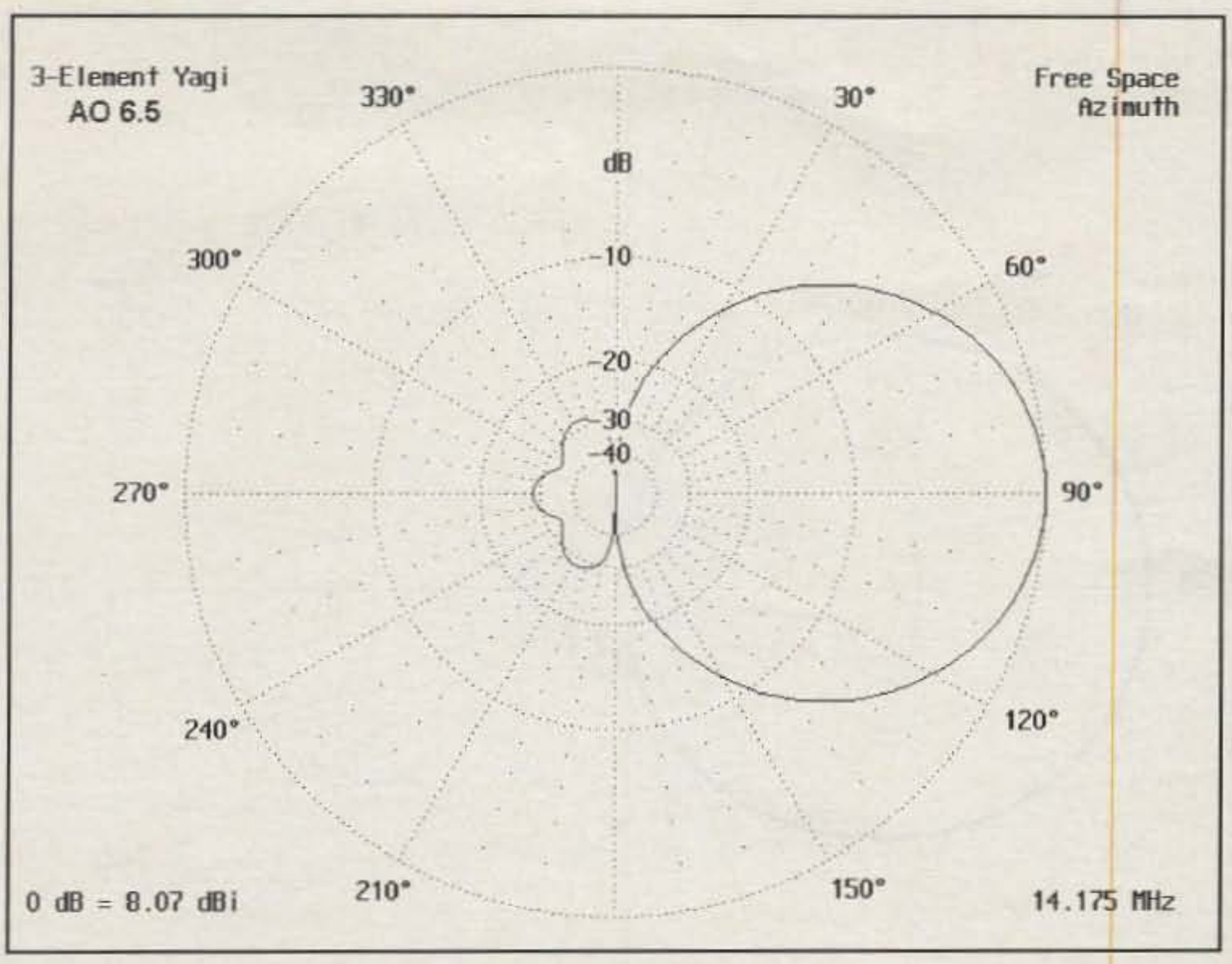

Fig. 4– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi in AO 6.5.

E-plane and H-plane patterns for antennas are convenient in free space. In a region of space, we do not have any reflecting surfaces, so it does not matter in what orientation we place an antenna. We can always derive E-plane and H-plane patterns. The patterns are significant in just this way: When we place an antenna horizontally relative to the earth, the E-plane pattern will dominate the azimuth pattern we derive. When we place the antenna at right angles to the earth at any height—that is, when we make it vertical—the H-plane pattern will dominate the azimuth pattern we derive.

In fig. 1, I could have set up the antenna vertically instead of horizontally in the software frame of reference. Had I done that, then the same two patterns would have emerged, but in reverse order. The elevation pattern would now correspond to the E-plane and the azimuth pattern would be the H-plane. In free space, that is the only difference of note. However, once we return to earth, the difference in orientation will make a big difference in how the antennas work.

Just to make life a little more complicated, we should note in passing that in NEC, the most used antenna modeling core, the native orientation to antenna positions is not azimuth and elevation. NEC refers to ψ (phi) and θ (theta) angles. Phi corresponds to azimuth, referenced to a zero point. However, theta is a "zenith" angle. That is, instead of counting in degrees up from the ground (or whatever is designated as the horizontal plane in free space), it counts down from directly overhead. If you see the "theta" notation, you can obtain the elevation angle just by subtracting the theta angle from 90 degrees.

Variations on A Theme

Let's dwell a bit on the hypothetical Yagi in fig. 3. For the moment, we shall consider only the free-space E-plane pattern, which is the azimuth pattern in most pattern-generating software. One of the key dimensions you must track is the progression of angles around the perimeter of the outer circle. To illustrate this point, consider figs. 4, 5, and 6. All three patterns show the same antenna model with their lengths plotted along one axis (call it the X-axis) and their distance apart plotted along a second axis (call it the Y-axis). The Z-axis would represent height, either measured from the ground or—in free space—measured above and below the plane made by the X and Y axes. We can call this last dimension the Z-axis.

I plotted these antennas in this way to illustrate that you may see different conventions used by different software in the production of antenna patterns. The fig. 4 pattern orients zero degrees at the top of the graph, with 90 degrees to the right. In fig. 5, zero degrees is to the right, with 90 degrees at the top. Fig. 6 places zero degrees at the top with 90 degrees to the left. Yet they all present the same pattern information.

Pattern-producing software may place varying amounts of supplemental data about the antenna on the pattern graphic. Very often, the pattern-maker has options on whether to include the data in the graphic or separately. Fig. 4 presents basic pattern-identifying information in the corners. Fig. 5 provides an optional chart of data overlaid on an unused portion of the graph. Fig. 6 is bare in the presented version, but might have had other information added.

Fig. 7 represents a pattern of the same antenna with a chart of fairly complete antenna data to the side. Notice that its

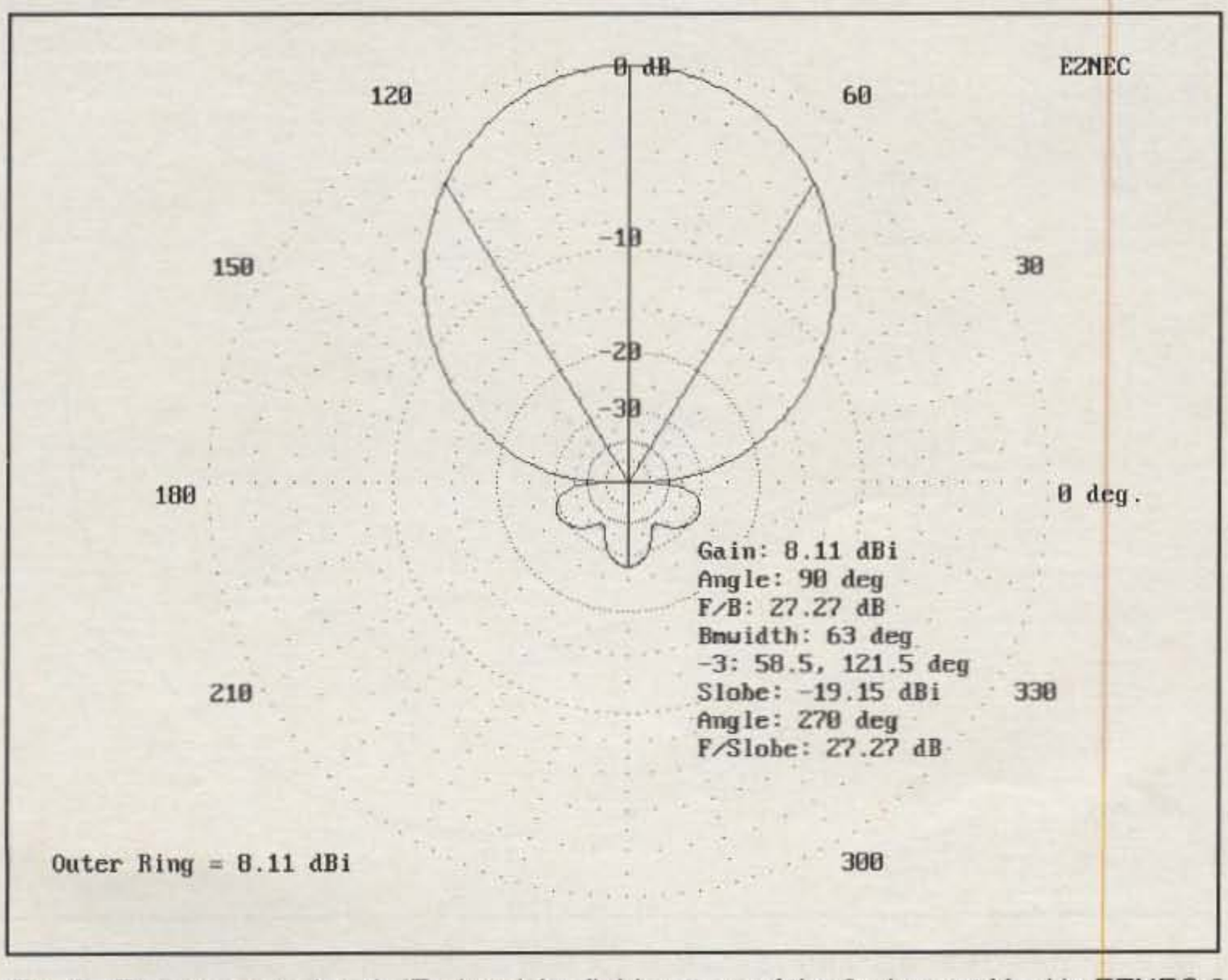

Fig. 5– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi in EZNEC 2.

data, as well as the data in the other graphics, tends to show small variations. Different modeling software—even when using the same calculation core—tends to show operationally insignificant variations in data output. Maximum gain figures that vary under 0.1 dB and front-to-back ratios that vary by under 1 dB are normally insignificant.

Free Space and Signal Strength

Before we come down to earth, let's consider how we determine how good an antenna may be. There are very many dimensions to this question, but the relevant one here is how we measure the antenna pattern. The patterns we have looked at contain both lobes and nulls, points showing gain maxima and minima. Fig. 7 provided a list of all the lobes of the 3-element Yagi, giving their angular direction. Fig. 5 gave us information on the main lobe (the strongest) and the side lobe (or secondary lobe—the second strongest). Conveniently for our exercise, this lobe was directly to the rear of the main lobe.

One of the key figures of antenna merit is **gain**. We measure the gain of an antenna by looking at the point in the 3-D pattern that shows the highest level of radiation field strength. We compare that with an arbitrary but standard field and register in decibels (dB) how much stronger or weaker the antenna field is.

In free space, the most common standard is the isotropic source, a hypothetical antenna point that radiates equally well in all directions. Therefore, the unit of maximum gain for our test antenna is measured in **dBi**, decibels stronger or weaker than an isotropic source that might be placed in the same position.

There are alternative measures you may encounter. Of these, the most prevalent is **dBd**, decibels gain relative to a dipole. In free space, the standard hypothetical lossless dipole of immeasurably thin wire has a gain of 2.15 dBi. Hence, the translation from dBi to dBd and back again is simple arithmetic. Consequently, in antenna modeling—from which most antenna patterns emerge—dBi has become the *de facto* standard.

In range testing antennas, measurements using dBd still have an important place. However, the reference is not to a hypothetical lossless thin wire dipole, but to a dipole that has real dimensions and material losses. Signals transmitted from it or received by it are carefully measured. Then test antennas are likewise measured and compared to the standard dipole. The gain of the test antenna may then be specified in dBd. However, the dipole used as the standard for the test must be completely described, since dipole characteristics can vary slightly according to the material used as well as the

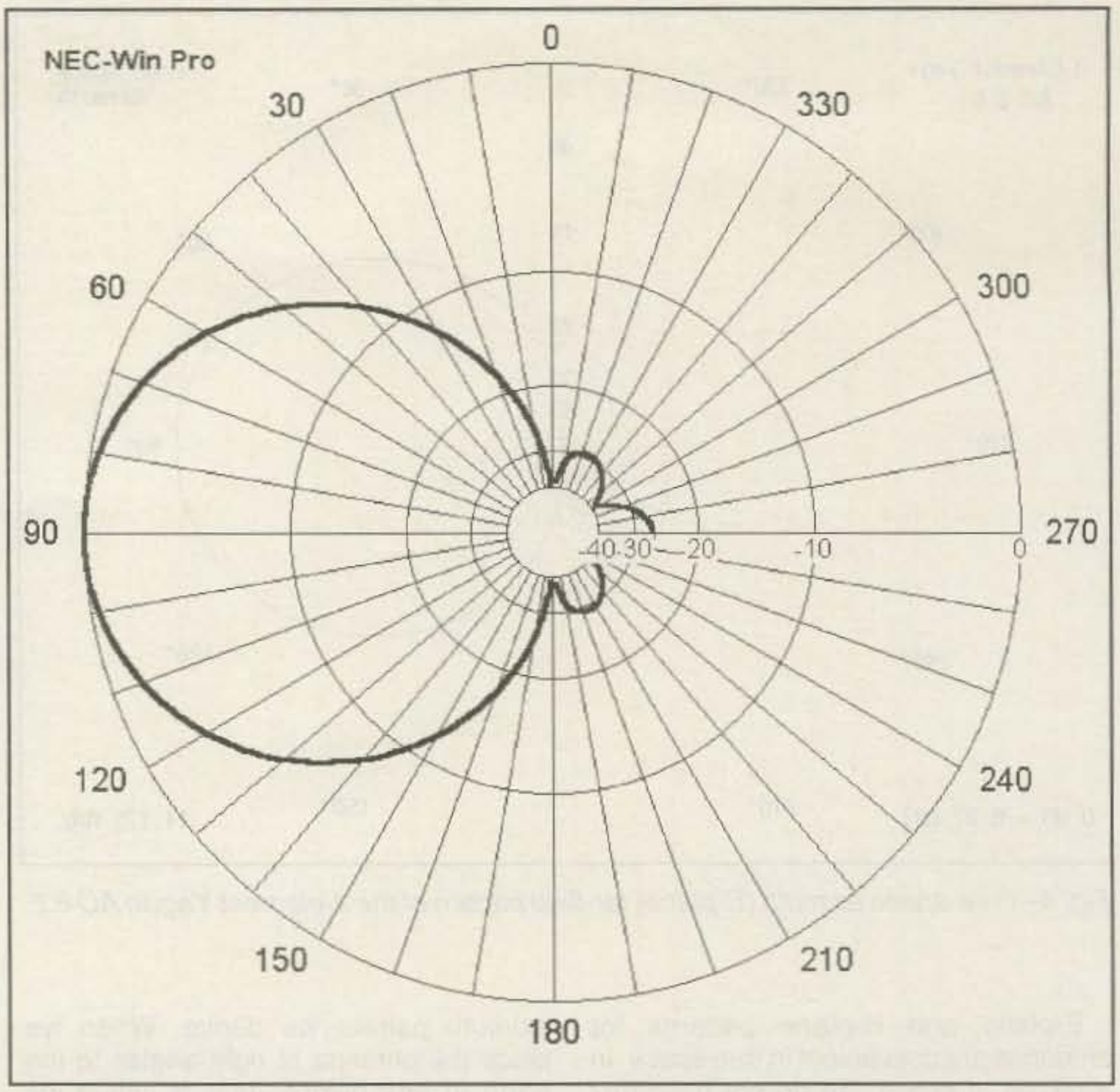

Fig. 6– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi in NEC-Win Pro.

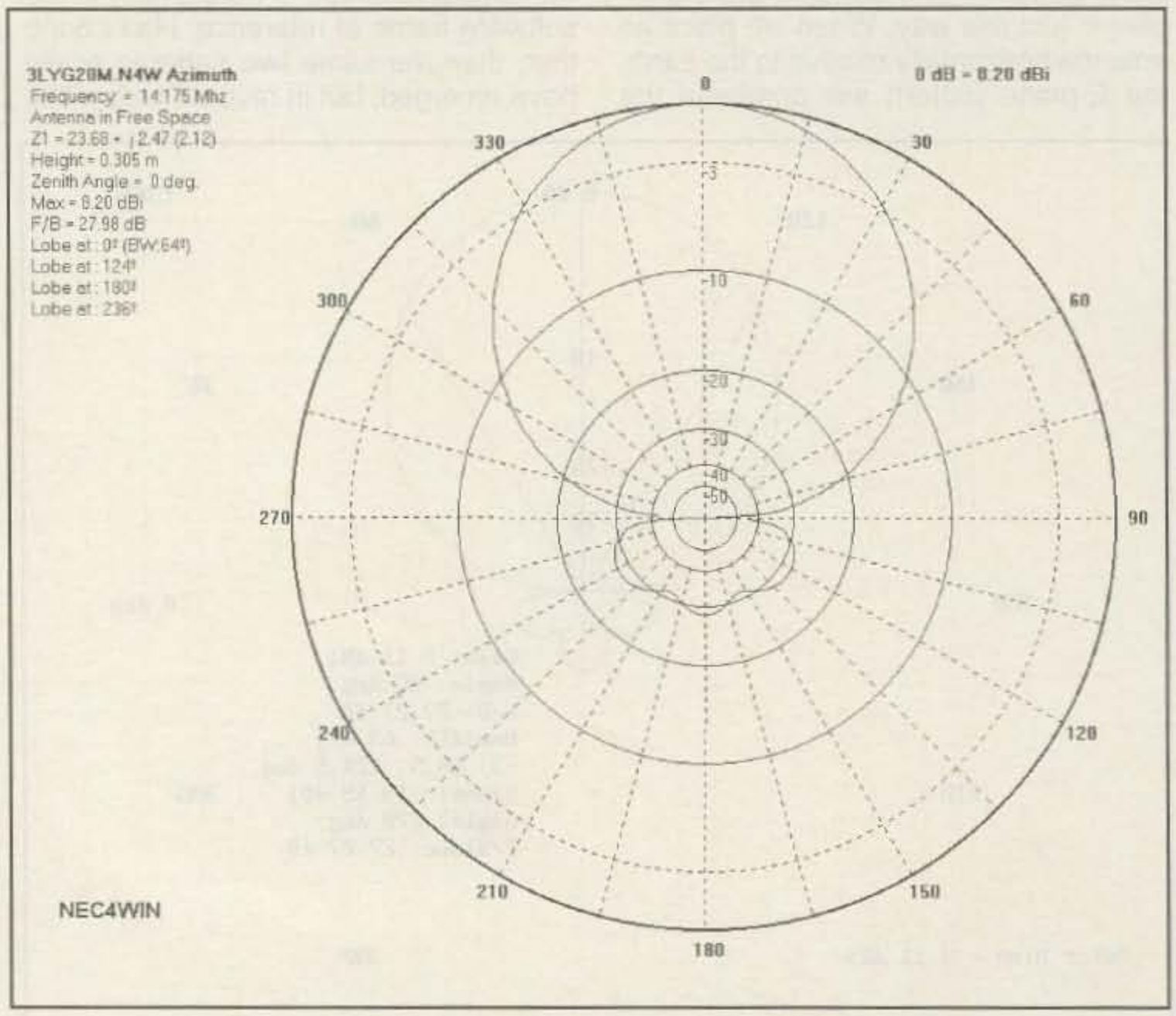

Fig. 7– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi in NEC4WIN.

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antenna height in terms of wavelengths or fractions of a wavelength.

The measurements just noted apply mostly to horizontal antennas. Dipoles are less universally used as standards in the testing of vertical antennas.

With the increasing use of antenna modeling software—especially NEC and MININEC—as vehicles of comparison of antenna designs, dBi is becoming the most common measure of maximum antenna gain in the most favored direction.

Front-to- . . . Back? Rear?

As shown in the Yagi patterns, many antennas exhibit unidirectional patterns—that is, patterns with maximum gain in only one direction. Unlike the bidirectional pattern of the common dipole in fig. 1, the Yagi beam (and many other antennas) has a much higher gain in one (forward) direction than in the other (reverse) direction. How much difference there is between the two directions is a measure of how well the antenna may suppress signals from the rear relative to signals from the forward direction.

There are several ways of measuring the difference. Perhaps the most common is the **180-degree front-to-back ratio**, sometimes simply called the front-to-back ratio. To obtain this value, we simply subtract the gain to the rear from the gain forward along a straight line running from the point on the pattern of maximum gain through the pattern center where the antenna is and out the rear of the pattern. Using the data presented in fig. 5, if the forward gain is +8.11 dBi and the rear gain is –19.15 dBi, then the front-to-back ratio is 27.26 dB. (In dBd, for our free-space model the forward gain would be 5.96 dBd, while the rear gain would be –21.30 dBd, for a net front-to-back ratio of the same 27.26 dB. Note that the 0.01 difference in the numbers here and those in the figure is a function of rounding in the software; the difference is insignificant.)

Note, however, the rear portion of the antenna pattern. The 180-degree direction represents a special portion of the pattern where signal rejection is greatest. However, gain to the rear and off to the sides of the "dimple" is higher, meaning less rejection of signals. For this reason, alternatives to the 180-degree front-to-back ratio are often used.

One system, sometimes called the **averaged front-to-rear ratio**, averages the gain for a rear quadrant of the antenna. This figure of merit gives an average front-to-rear ratio that many believe is a better measure of actual antenna performance in signal rejection. A further alternative is the **worst-case front-to-rear ratio**, which simply compares the forward gain with the highest gain found in the rear quadrants of the antenna.

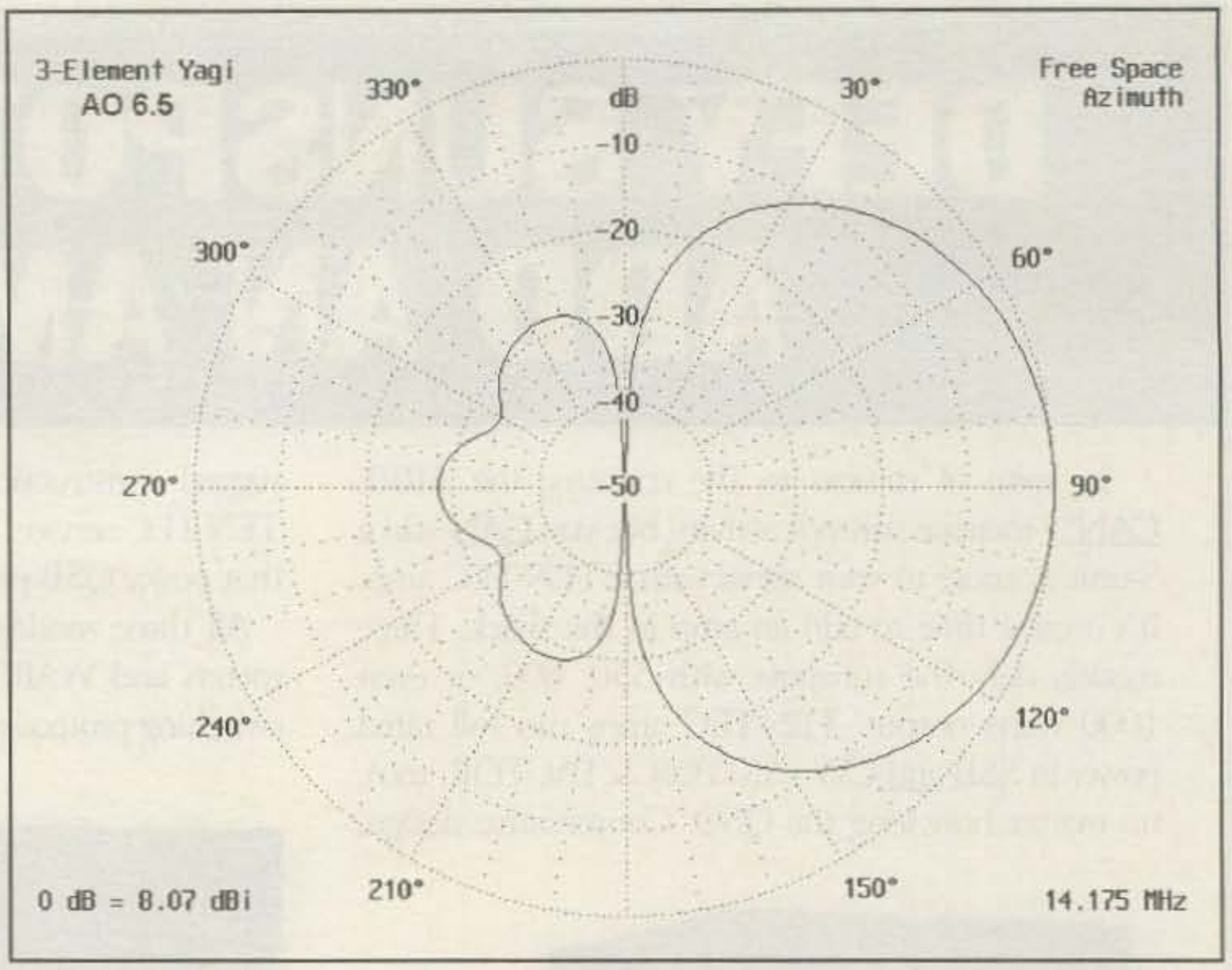

Fig. 8– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi using a polar plot with linear divisions.

When interpreting statements about antenna performance, you can examine the antenna pattern and often determine what standard of rear performance is being used even if an author doesn't tell you.

Polar Plots and Linear Graphs

The antenna patterns displayed so far use the most common format—the **polar logarithmic plot**. The antenna is at the center of the graph, and far field strengths are plotted in a circle for all relevant directions. In free space, the plots for azimuth and for elevation both encompass 360 degrees. Although the outer circle can be specified at any level, most patterns use the antenna's maximum signal in the favored direction as the graph edge. Inner circles, as shown in figs. 4 through 7, represent lesser signal levels, measured in dB lower than the level of the outer ring.

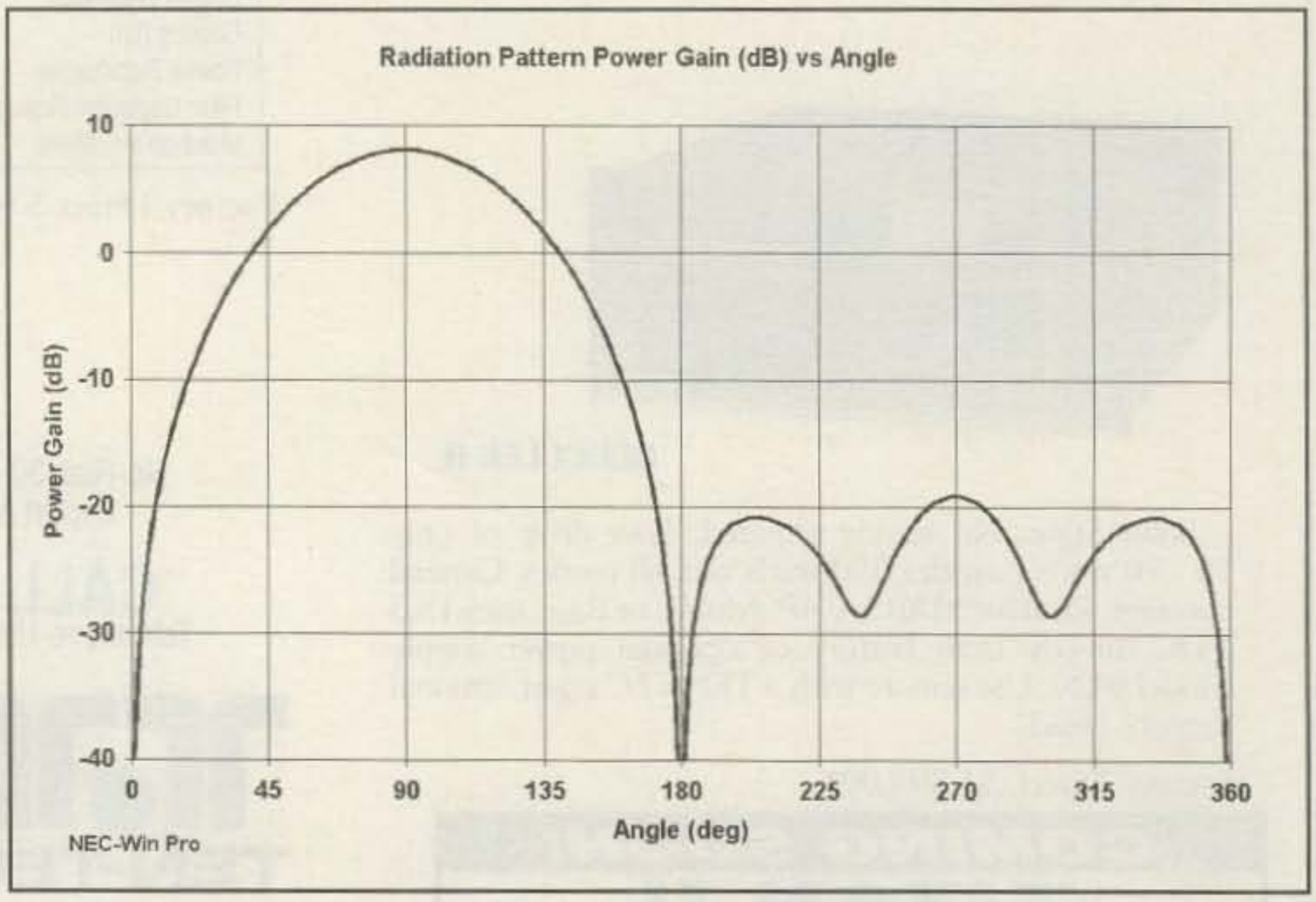

Fig. 9– Free-space azimuth (E-plane) far-field pattern of the 3-element Yagi using a linear graph.

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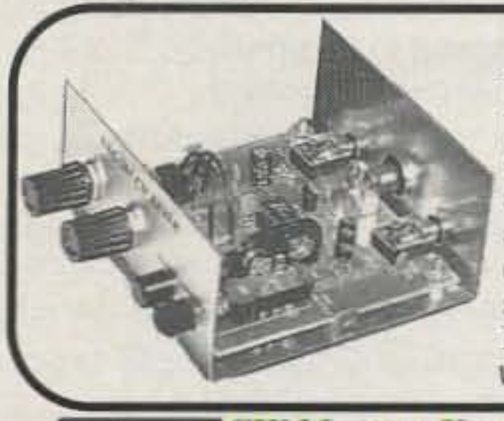

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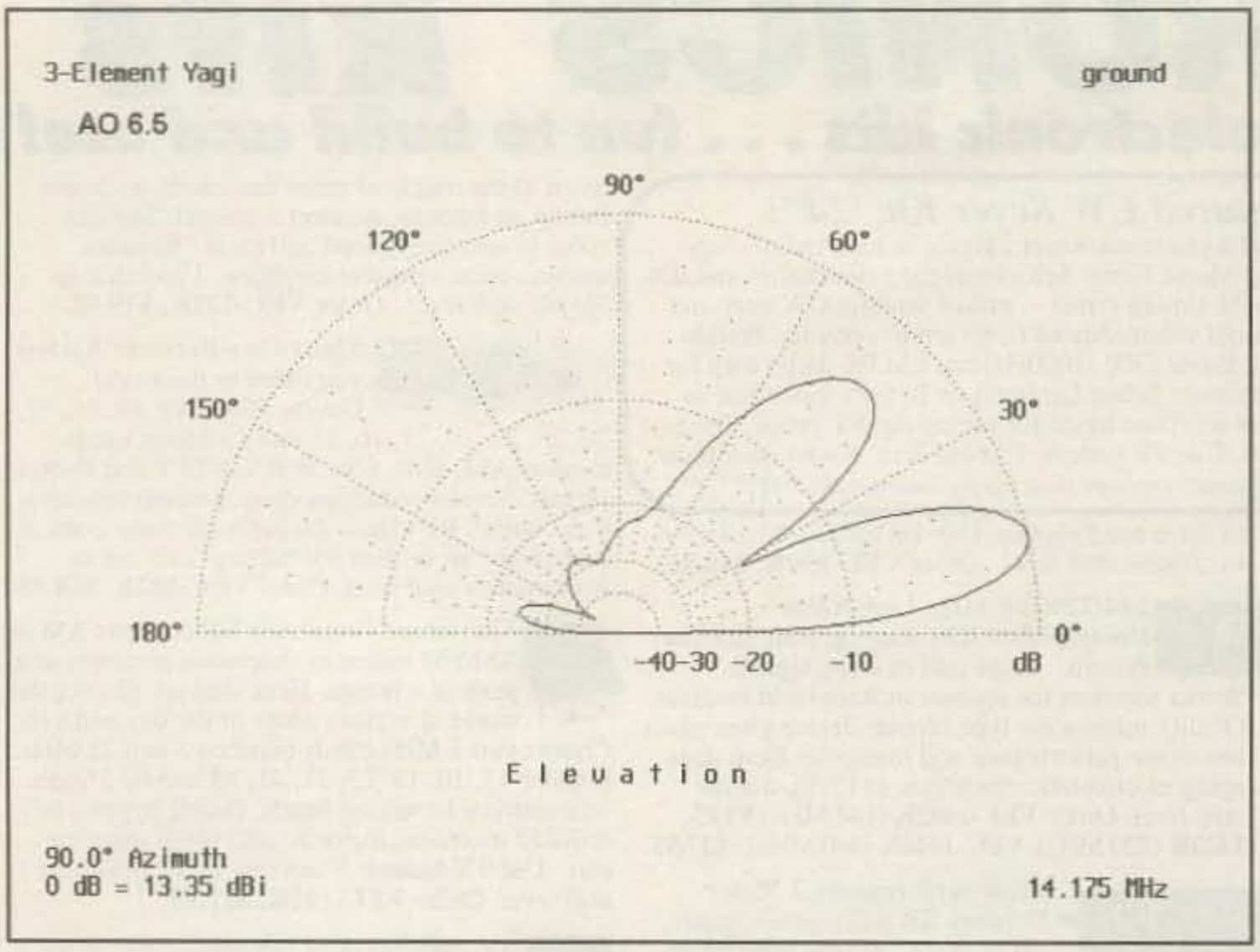

Fig. 10– Elevation pattern of a 3-element Yagi one wavelength over average ground.

Note, however, that the inner circles are not equally spaced, but represent a logarithmic progression. The higher the negative number toward the center, the more compressed the circles become. This most common log plot is often said to show with greatest clarity the high-gain features of the pattern.

Fig. 8 shows a common alternative—the **polar linear plot**. Here the circles of decreasing gain are equally spaced, which tends to clarify the details of the low-gain portions of the pattern. When looking at an antenna pattern, it is always necessary to note whether a log or linear plot is being used, especially when assessing matters such as front-to-back ratio. The rear pattern lobes appear very different in the two figures, even though exactly the same data is being displayed by both.

A third way to present antenna pattern data is with a standard **linear graph**. Fig. 9 shows the same antenna plot on a graph where the X-axis is linearly divided into 360 degrees and the Y-axis represents the antenna's gain. When made large enough, linear graphs can show very fine pattern detail. However, to this date they are fairly rare in amateur literature.

So where are we so far? Actually, we have come a fairly good distance. Although we are still in free space, we have distinguished the common antenna pattern azimuth and elevation orientations from E-plane and H-plane representations of the pattern. We also have compared the various gain measures (dBi, dBd), with dBi becoming perhaps the most used measure. We have also seen how to measure front-to-back ratio, with reference to features on the antenna pattern. Then we looked at three ways to present antenna patterns, with the polar log plot being the most common.

Having looked at all these options, we will standardize the rest of our work. We will use azimuth and elevation polar plots with log scaling, and when we refer to front-to-back ratio, we will employ the 180-degree ratio as our general standard. We select these options not because they are always the best ones, but because they are the ones you will encounter most often in amateur radio antenna literature. Now we can come back to earth.

Down-to-Earth Reflections

An antenna over real ground changes the way in which we use antenna patterns. Let's consider the elevation pattern first. A typical horizontally oriented Yagi pattern is shown in fig. 10, the same one as used in the free-space patterns of figs. 4 through 7. Notice that half of the free-space pattern is missing, the part that would be below ground if the earth did not reflect antenna signals.

Second, notice that the pattern is elevated. Due to signal reflections, the elevation angle of maximum radiation (also called the **Take-Off angle**) is not at zero degrees. Since we are dealing with far field patterns instead of ground waves, there is essentially no signal at zero degrees, and antenna modeling patterns will not show line-of-sight radiation in their far field patterns.

Third, notice that the forward lobe is not a line, but a lobe having a certain vertical thickness. The common way to designate this thickness is by measuring the number of degrees between points where the signal is reduced in strength by 3 dB relative to its maximum strength. This figure is called the **vertical beamwidth** of the antenna pattern.

For horizontally polarized antennas, such as our Yagi, the pattern of lobes, the take-off angle of the lowest (and usually strongest) lobe, and the vertical beamwidth will vary with the antenna height, as measured in fractions of a wavelength. Suppose we have two 3-element Yagis, one for 10 meters and one for 20 meters. We place the 20 meter Yagi at a height of 70 feet and the 10 meter Yagi at a height of 35 feet. Since each antenna is at one wavelength height, we would expect very similar elevation patterns from them—in fact, just the pattern shown in fig. 10.

We will take another look at polarization of the antenna next month, since it makes a considerable difference in antenna performance over real ground. Next month we'll also get acquainted with what happens to the azimuth pattern when we place our Yagi over real ground.

(To Be Continued)

Note

1. The antenna patterns used to illustrate the ideas in this article are taken from several commercial implementations of either MININEC or NEC-2, the most frequently used antenna modeling calculation cores. The most familiar implementations of these cores come from the following sources (listed in alphabetical order):

AO (MININEC) and NEC-Wires (NEC-2): Brian Beezley, K6STI, 3532 Linda Vista, San Marcos, CA 92069; e-mail: <k6sti@n2.net>.

EZNEC (NEC-2) and ELNEC (MININEC): Roy Lewallen, W7EL, P.O. Box 6658, Beaverton, OR 97007; e-mail: <w7el@teleport>.

NEC-Win (NEC-2): Nittany Scientific, 1700 Airline Highway, Suite 361, Hollister, CA 95023-5621; e-mail: <sale@nittany-scientific.com>.

NEC4WIN95 (MININEC): Magjid Boukri, VE3GMI, Orion Microsystems, 197 Cr. Joncaire, Ile Bizard, Quebec, Canada H9C 2P7; e-mail: <mboukri@cam.org>.

Nothing in this article should be interpreted either as an endorsement or as a criticism of any particular software.

In addition to the commercial implementations noted above, there are other antenna modeling software packages available, some based on the most-used cores and some based on individual or proprietary cores. Also obtainable are some specialized output packages for specific graphical purposes. ■

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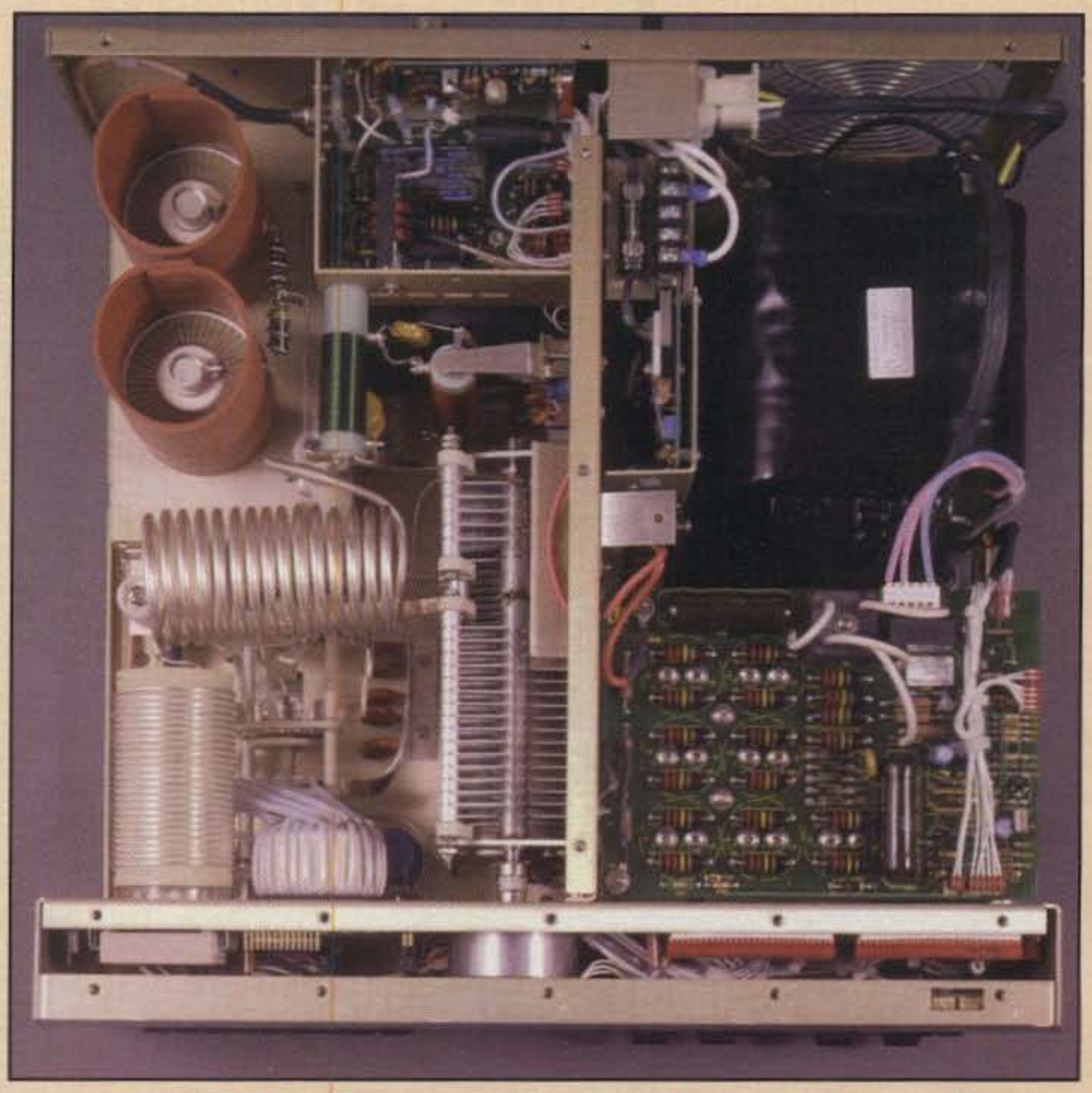

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The AEA CableMate Analyst

BY PAUL CARR*, N4PC

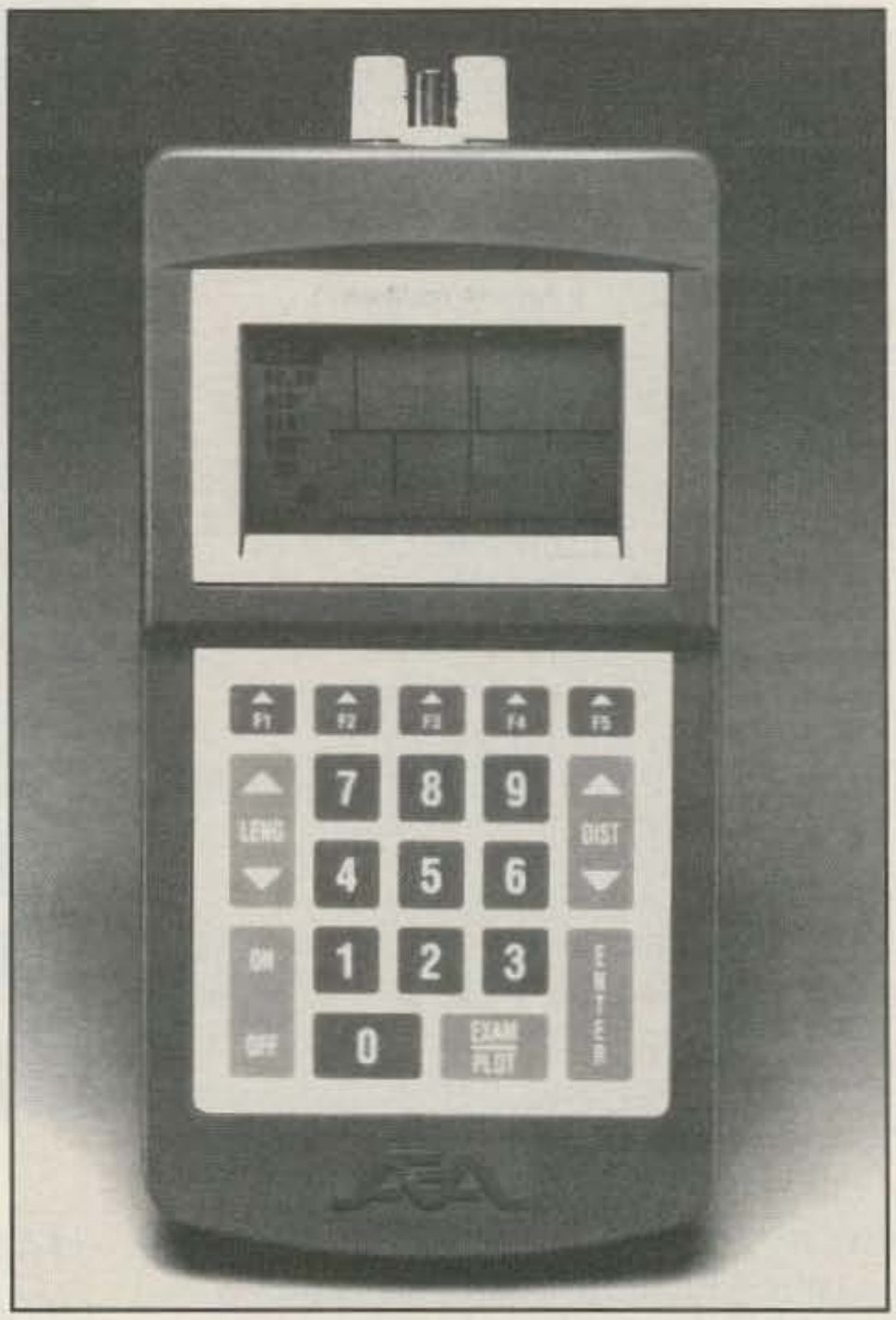
If you tune across the amateur bands, it is not unusual to hear an individual remark that he/she has just installed a new antenna of some description, and the results have been less than expected. Very often the antenna is blamed for the lack-luster performance. I wonder how often that the same feeder cable (age and condition unknown) is at fault for the poor performance? I am not opposed to using the same feeder system if it is known to be in good condition. How can you determine the condition of existing feed line? Well, that has been a formidable task. However, that job now has a very straight-forward procedure. Enter the Advanced Electronic Applications (AEA) CableMate Analyst.

The AEA CableMate is a hand-held time domain reflectometer (TDR) designed to test cables and to determine the location of any faults that may exist along the cable. It injects a signal at one end of the cable being tested and graphically displays the polarity, relative magnitude, and time (converted to distance) of any reflections that are returned by impedance discontinuities along the cable. Reflections of an impedance that is less than the cable's characteristic impedance will cause the pulse to change polarity. The magnitude of the reflected pulse will depend on both the severity of the discontinuity and the inherent cable loss.

Access to the many features of the CableMate is simplified through the use of five function keys. The actions of these keys are defined by various menus that appear above them on the display. The most-often used functions are assigned dedicated keys for quick access.

Up to fifteen plots and their parameters can be saved in non-volatile memory for later comparison. Each plot can easily be assigned a meaningful name which appears whenever the plot is displayed. An EXAMine mode allows plots to be frozen in the display for future examination, and a cursor allows measurements anywhere on the plot.

The currently displayed plot can be saved to a PC file and downloaded back to the instrument's memory later, if desired. The CableMate may also be controlled from an ASCII terminal or PC, and real-time plots displayed on the PC.



The AEA CableMate hand-held time domain reflectometer.

Features

The following is a synopsis of the features of the CableMate:

- •Distance readings in feet or meters
- •AUTO function quickly finds the closest fault
- •Self-test and calibrate functions
- •Automatic turn-off to extend battery life
- •Non-volatile memory for last-used settings, 15 user-named plots/setups, and 96 editable cable descriptions
- •Remote control and display; can transfer plots and cable table to/from PC
- •Noise filtering
- •Extensive on-screen Help.

Preliminary Tests

AEA has made it easy for the user to have a quick tour of the CableMate's features. Before getting started, you will need to reset the unit to make sure of what you are going to see (to clear the unit of any extraneous information). With the unit turned off, hold down both the F1 and F5 function keys and press the ON key until the AEA logo appears. The unit has been returned to its default condition. Since no cable is connected, the current "plot" appears as a simple baseline.

The information on the left side of the "plot" has been given the default name of NEW. The unit is set for a characteristic impedance of 52 ohms and a velocity factor of 66%. The distance to the center of the plot is 100 feet, and the length of the cable represented by the plot is 195 feet.

The unit has a built-in demonstration. First, turn the unit off. To access the demonstration feature, hold down the F3 key while pressing ON. An hourglass icon appears briefly on the STAT line of the display, indicating that the unit is measuring noise on the imaginary cable. Then two vertical lines appear—one above the baseline and one below it. These represent reflections of pulses generated by the unit from impedance discontinuities along the cable. Next examine each "fault."

Press the EXAM/PLOT key. A cursor appears at the center of

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Say You Saw It In CQ

the plot and an "eye" icon confirms that the unit is in the "examine" mode. There are several ways to move the cursor. The DIST keys move the cursor left or right one pixel each time they are depressed, or continuously if they are held down. The ENTER key returns the cursor to the center. When the reflections are displayed, you can use the LENG keys to snap the cursor to the next or previous reflection. Moving the cursor also updates the distance readout. When the cursor is on a reflection, the magnitude of that fault is displayed on the DB scale.

The LENG key can be used to zoom in or out. The length of the cable is halved or doubled each time the key is pressed until the upper or lower limit is reached. You can also select a specific length by entering a length on the keyboard and then pressing the LENG key. The unit will automatically select the closest length that corresponds to the entry you selected.

If you want to save the current plot, press F1 to display the main menu. Then press F2 (PLOTS), F3 (STORE), and F1 (#1). The plot and the settings used to obtain it have been saved with the default name "NEW," but you could have renamed it if you so desired. To set your mind at ease, there is a very good 'HELP' menu that is just a click away at any time.

Test Results

After spending time with the demonstration information provided, I began to look around the shack for some old cable to test. The first piece of cable I found was an old piece of RG-58U. I connected the cable to the CableMate and began my tests. I first began by leaving the end away from the CableMate open and measured the distance from the unit to the open. The CableMate indicated a distance of 94 feet. Next I shorted the cable at the distant end, and the CableMate again indicated a distance of 94 feet to the fault. So far, so good. Next I removed the short from the coax and replaced it with various values of resistors. The distance to the fault remained the same, but the amount of loss indicated by the CableMate varied. These test were duplicated with a length of balanced feed line. The impedance and velocity factor on the unit had to be changed to compensate for the different line. The unit has a built-in 4:1 balun, so the impedance selected was one-fourth the impedance of the line. The tests tracked very well with those obtained with the RG-58. The CableMate worked flawlessly!

Availability

The CableMate is available from Advanced Electronic Applications, Inc., a division of Tempo Research, 1221 Liberty Way, Vista, CA 92083 (760-598-9677). It is priced at $499.95 plus $3.00 shipping and handling ■

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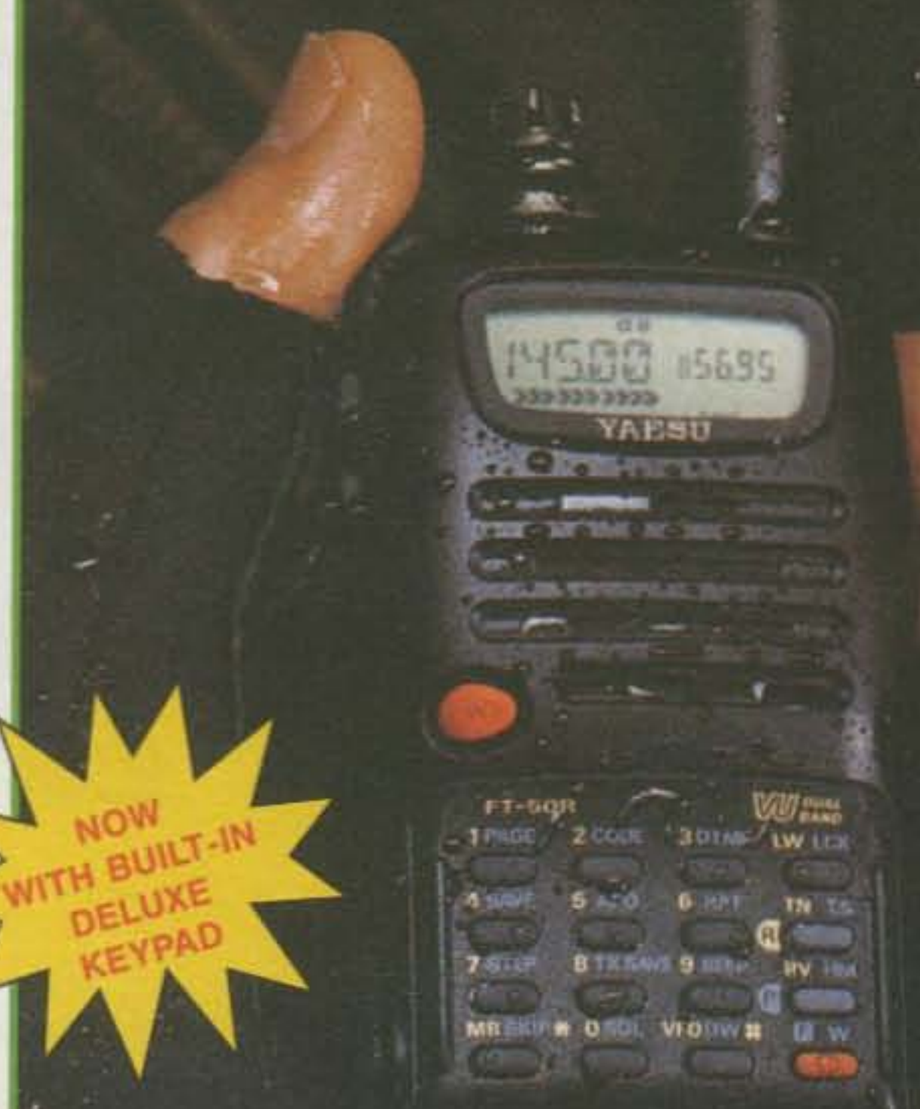

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Birdies chirping in the morning is a pleasant way to wake up. However, if they take up residence in your receiver, it's time for some drastic measures.

How To Build A Personal Computer AC Line Filter

BY STEVE L. SPARKS*, N5SV

The world of personal computers in the ham shack is here. In fact, many of us are so bold as to build our own computers with "pieces" purchased at a discount store or through a mail-order house. This is particularly attractive if we have a "computer Elmer" to bail us out when Murphy strikes. You can save significant dollars, but your computer most likely will not have an FCC Compliance Stamp.

What do we do when our receivers are overrun by singing birdies which disappear when the computer is turned off, as mine did on the 160 meter band? The two graphs, figs. 1 and 2, show the before and after results of an AC power line filter being installed. The straight line in figs. 1 and 2 is the FCC Spec for class B compliance for spurious noise on the AC line. Wow! Was my computer putting out the noise! This noise is generated by the switching regulator supplying the computer cards operating at about 20 kHz. The noise is conducted back into the AC power line and then radiated to the receiv-

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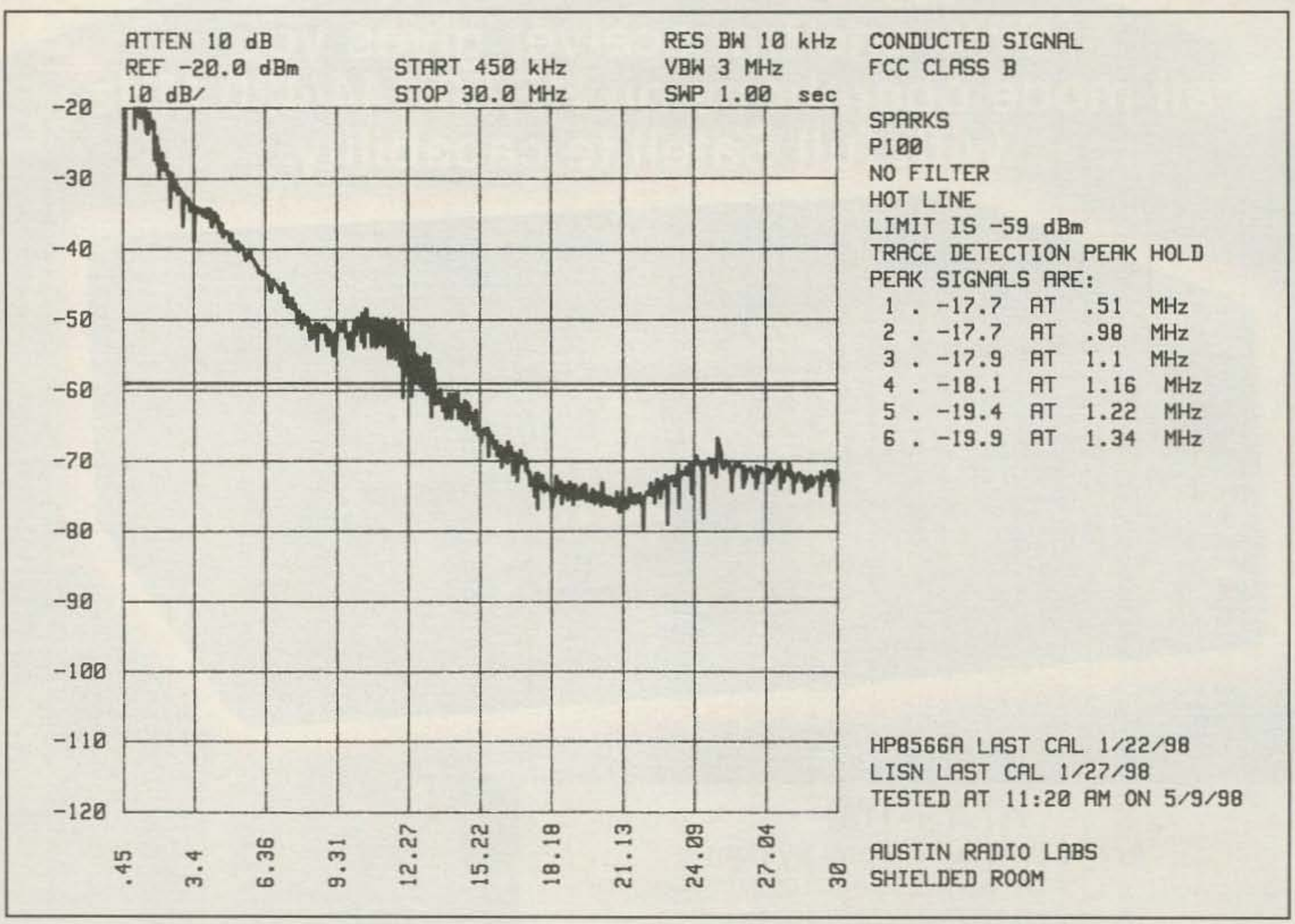

Fig. 1– Spectrum analysis of the noise on the AC hot line from the PC without the line filter.

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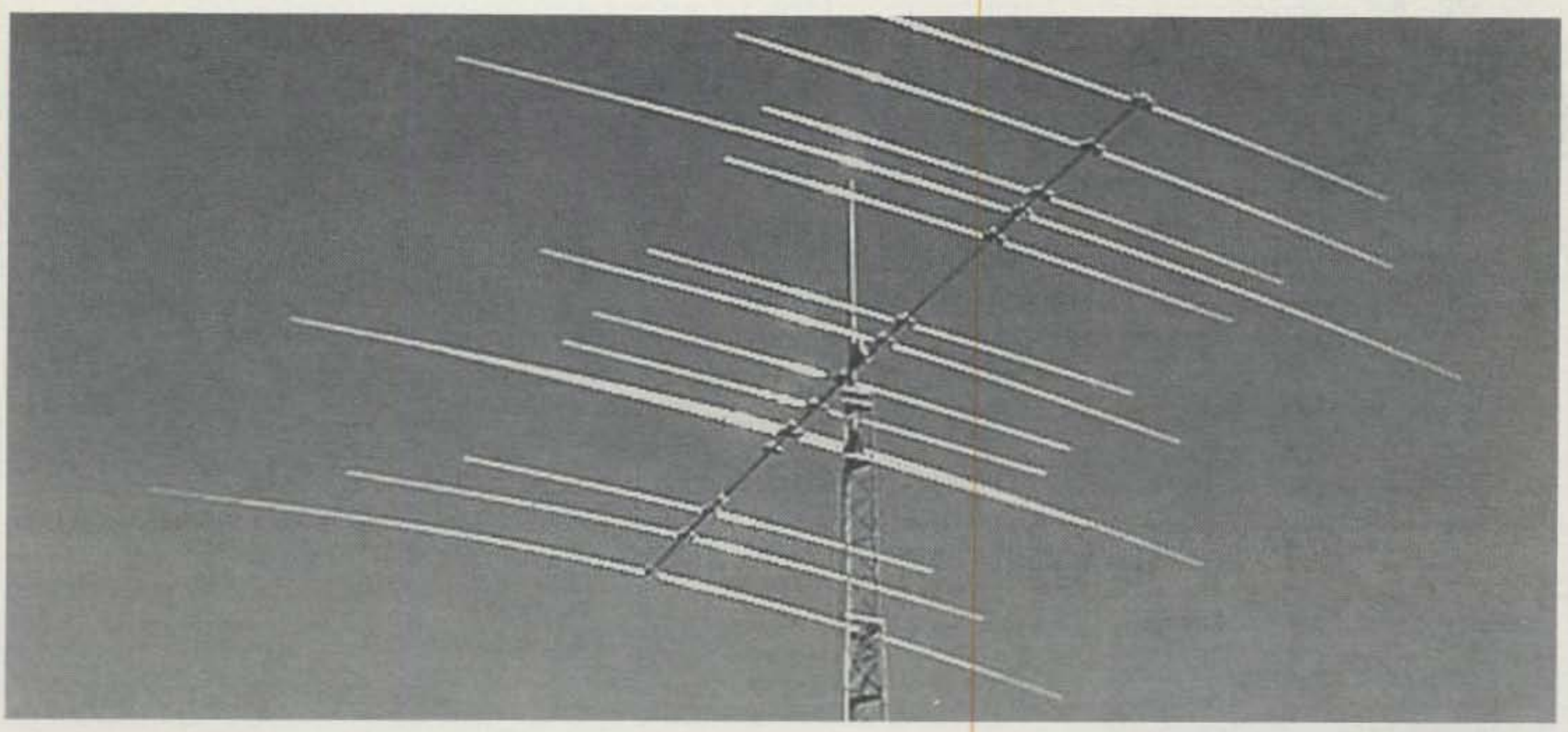

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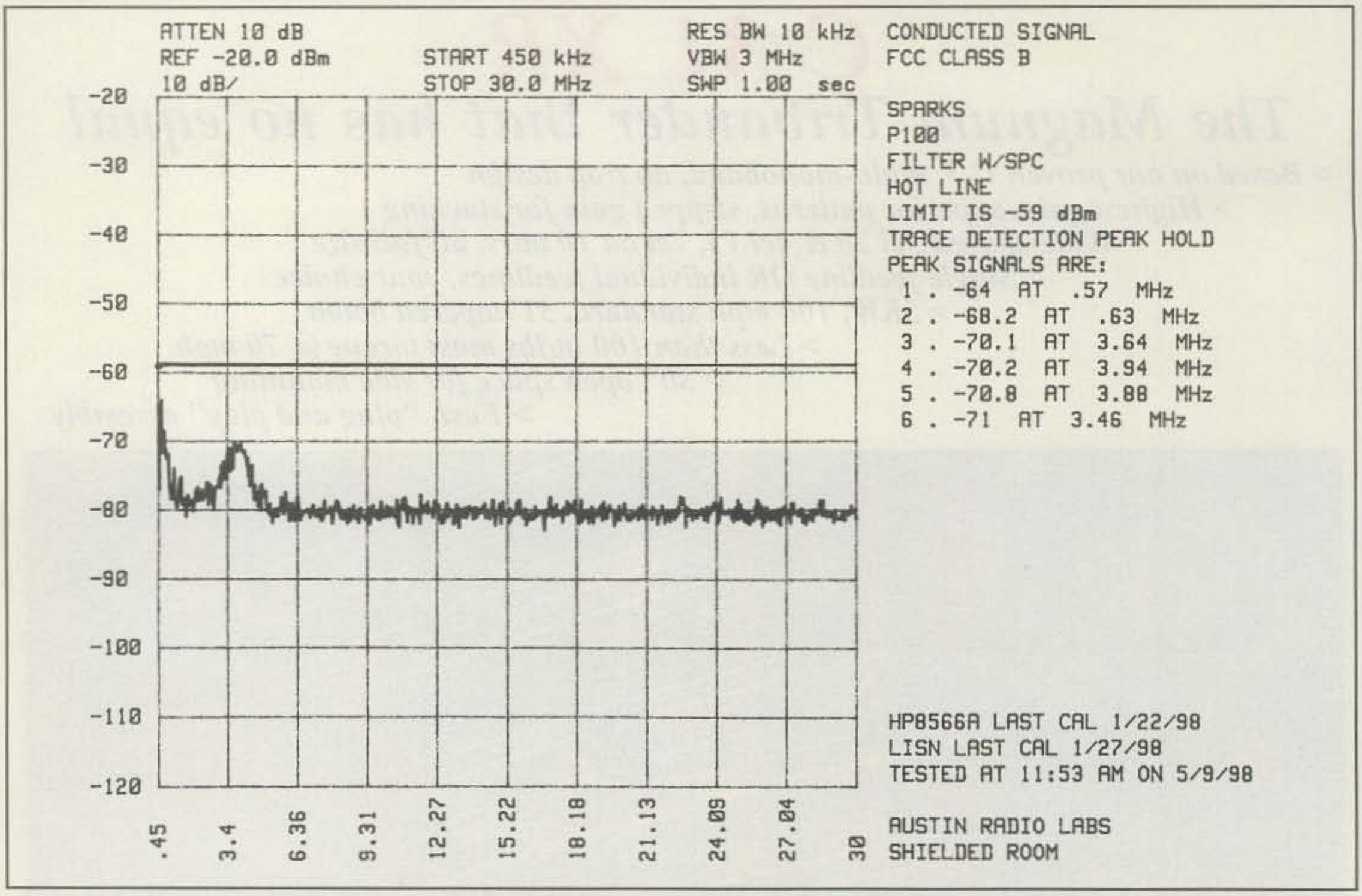

Fig. 2– Spectrum analysis of the noise on the AC hot line from the line filter attached to the PC.

er. The fix was somewhat simple and reduced the line noise by about 50 dB. The schematic is shown in fig. 3 and the actual construction is shown in the photo.

Notice in the photo that I cut the power cord and used epoxy to mount the end going to the computer attaching it to the LMB box. This allows mounting the filter very close to the computer. You must also ground the box to the computer. Ground-

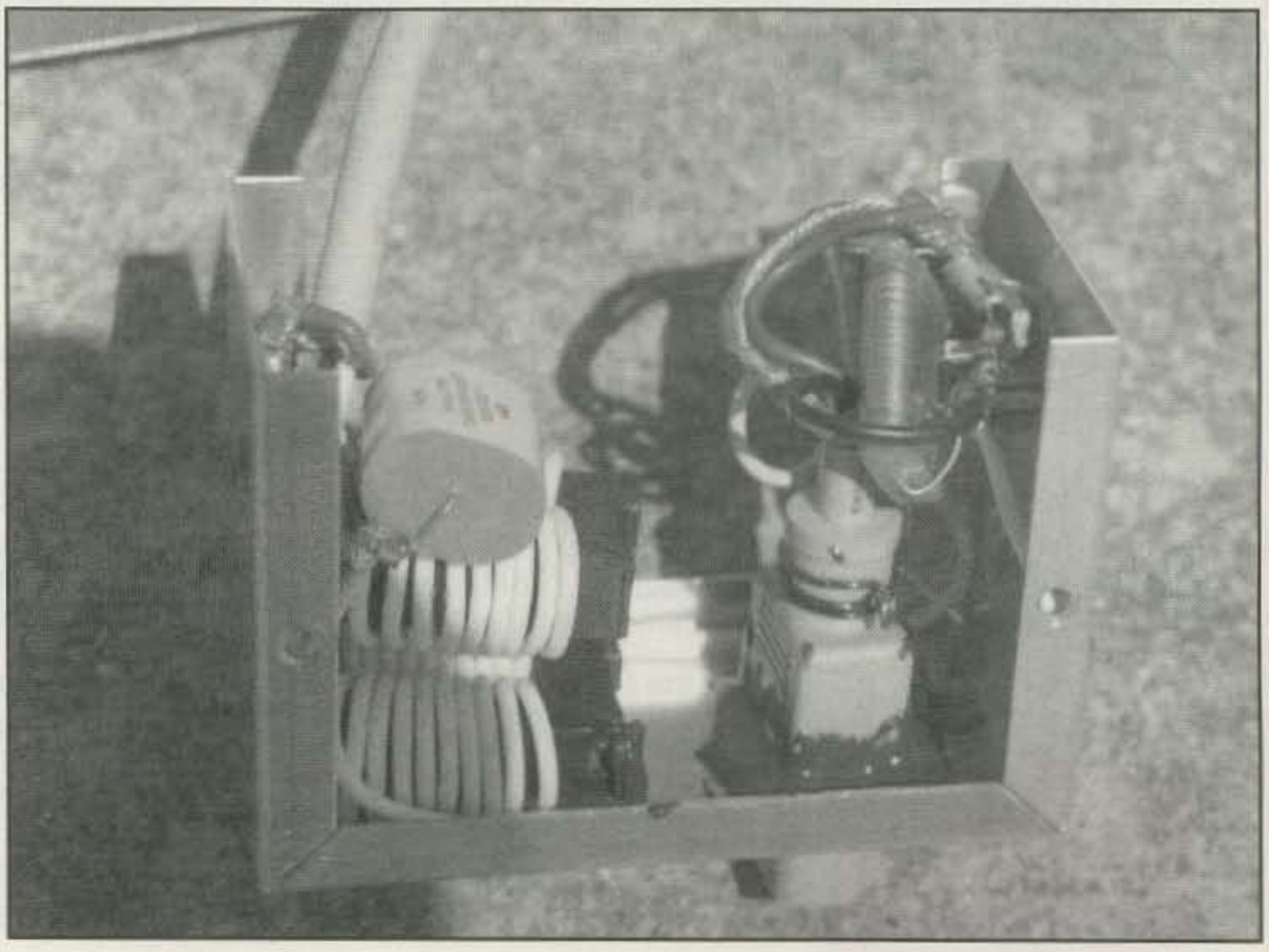

Photo of the actual line filter.

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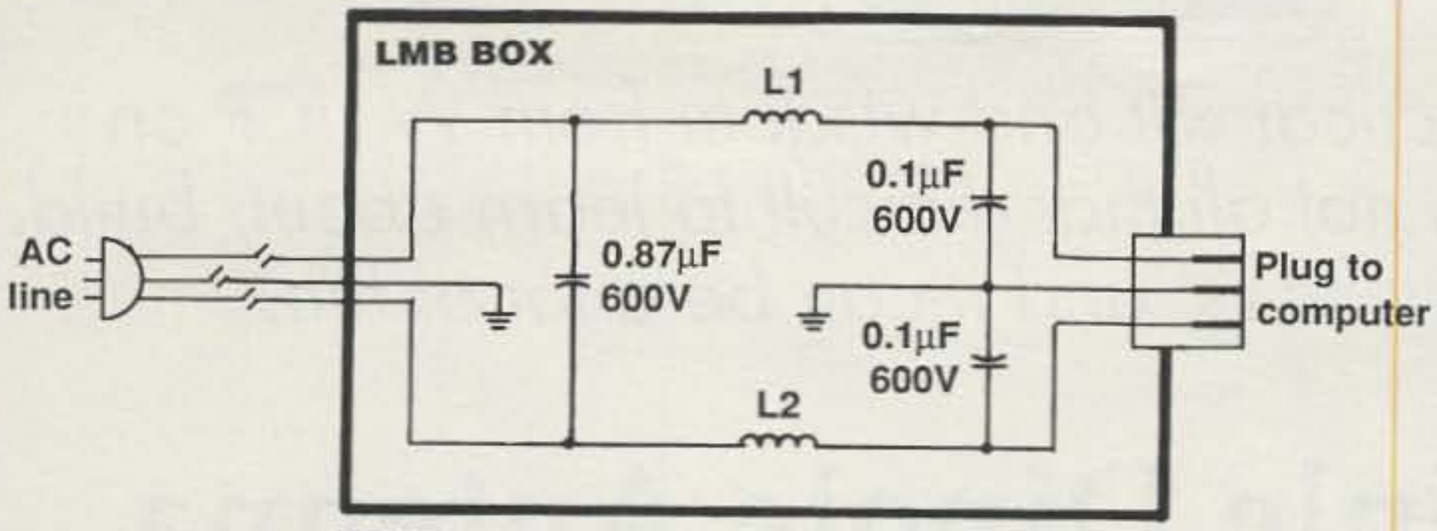

NOTE:
L1, L2 = Radio Shack snap open ferrite cores, 20 turns #14 stranded wire, 10 turns per side

Fig. 3– Schematic of the line filter. See text for component description.

ing the box to the computer took the last birdie out of my receiver.

Construction Hints

The choke cores used can be purchased at RadioShack. These are the typical split cores used for various filters. When you wind the chokes, L1 and L2, be sure to always run the wire through from the same direction or the magnetics will cancel. The three capacitors used in the filter need to be high-quality mylar types, and the lead length needs to be as short as possible. All of this will improve the effectiveness.

A shielded and unshielded line cord was tested with the filter and found not to make a significant difference.

If you need more noise reduction, try taping the face of your computer (on the inside) with aluminum or copper tape. This is where large plastic sections allow internal noise to radiate out through the case. There is no need to solder this tape. The capacitive coupling is usually enough. Just make sure it couples to ground.

I would like to express my thanks to Mr. Bob Ripley of Austin Radio Labs for all of his work and the use of his facilities in testing this computer and line filter. ■

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CIRCLE 85 ON READER SERVICE CARD

Here is some more practical wit and wisdom from W1ICP on our favorite subject. It's not all that difficult to learn about, build, and use a variety of antennas, and it can be a lot of fun.

The Multiple Dipole Antenna

One of Amateur Radio's Most Economic Antennas

BY LEW McCOY*, W1ICP

Years ago I came up with the idea of feeding multiband dipoles with a common feed line—50 ohm impedance coax. Don't misunderstand. I did not invent the system of feeding several dipoles with a single feed line. However, I believe I was among the first to publish an early article on the subject.

Over the years I have experimented with many types of multiple antennas fed from a common feed line, and I know I have garnered some useful information worth passing on. One thing I found out at the beginning was that this is about the cheapest way to get good antennas without hocking the family jewels.

There are a couple of basic rules you should follow when making a wire dipole. Once you learn a few simple facts about these popular antennas, the whole project becomes a piece of cake. For example, the formula for making a half-wavelength dipole is simple. The length of any half-wave antenna can be found by dividing 468 by the frequency to be used. For example, a 20 meter dipole, say for 14.2 MHz, would be 468 divided by 14.2, or 32.9 (32 feet 11 inches). It is important here to point out to any beginner that for the HF bands, 80 through 10 meters, these dimensions are not really critical. For example, if the antenna happened to come out to, say, 33 feet, it would work just as well at 14.2 MHz as one cut exactly. Where inches become important is on VHF, where you should try to make the antenna fit the formula as closely as possible.

To make this whole project easy, I have included the lengths of dipoles for all of the HF bands from 10 through 160. These are listed in Table I.

Band	Frequency	Length
160 m	1800 kHz	260 ft.
80 m	3500 kHz	133.7 ft.
	4000 kHz	117 ft.
40 m	7100 kHz	65.9 ft.
30 m	10.1 MHz	46.33 ft.
20 m	14,150 kHz	33.07 ft.
17 m	18.1 MHz	25.85 ft.
15 m	21,250 kHz	22 ft.
12 m	24.4 MHz	19.18 ft.
10 m	28,500 kHz	16.42 ft.

Table I– Lengths of dipoles for the 10–160 meter HF bands.

There are a couple more basic facts that we should touch on to get our groundwork established. The feed-point impedance of a dipole that you hang up in your backyard will range from 100 to 50 ohms or less. The variations in value are caused by the effect of earth, or ground, and the height of the antenna above earth. Normally, we think of a half-wavelength dipole having a free-space impedance of 70 ohms. Sure, there are some astronauts out there, but most of us keep our feet planted on old Mother Earth, and she is the one with the primary controlling factor which determines the impedance of our antennas.

Another point to remember here is that a half-wavelength dipole, of course fed at the center of the antenna, can be very forgiving of many types of configurations as far as staying in that 3 to 1 or less matching range. What do I mean by that statement? I have made countless dipoles for many different bands and have put them up under some crazy conditions. For example, one time I wanted to put up an 80 meter dipole. However, I had only enough room to stretch out straight one half of the dipole; the other half took off at a right angle and then went off in another direction. As I recall, the whole area was only about 60 feet long at most. I ran as much of the 60 feet as straight out as possible and then ran the remainder at right angles. The antenna was a fair match for 50 ohm coax, and with this system I worked all over the world.

Keep in mind, then, that what we are discussing here is a dipole. Make it as high as you can, but don't be afraid to use it as an inverted Vee, an "L" shape, or what have you.

The modern transceiver is designed to work into a mismatch of less than 3 to 1. If the match is worse than that, the transceiver has circuits to make the transceiver shut down. You get a break here because any dipole cut for 40 meters through 10 meters will usually give you less than a 3 to 1match across those bands. Dipoles for 80 or 160 meters have different bandwidth and matching problems. I'll discuss those a little later.

A very popular question asked by new amateurs is "What kind of wire should I use for my antenna?" One basic fact is that the wire should be strong enough to support the coax you are using. I grew up using No. 12 solid copper wire, but I have used copper-covered steel fence wire, all kinds of regular electrical wire, and insulated wire—which brings up a point.

At one point in my career I used a bare copper wire on 80 meters and ran the wire through leafy trees. One night during a contest, a friend was running my station while I happened to go outside. I noticed that sparks were jumping from the wire to the tree leaves! Later I tried using insulated electrical house wire and it worked fine. Some electronic engineers will tell you that insulated wire will change the velocity factor of the wire and thereby change its electrical length. They are right, but only partially so. The electrical length will be very

*Technical Editor, CQ, 1500 W. Idaho St., Silver City, New Mexico 88061

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fractionally different—certainly not worth worrying about for HF antennas.

There are several wire dealers listed in *CQ*'s advertising section, and all of these are very reliable. Write or call them and ask for literature. Also, Sears, Home Depot, and other such stores sell electric, single-conductor wire, usually insulated, that will make good antennas. Use either No. 14 or No. 12. If you have access to farm suppliers, electric fence wire, which is usually No. 18 or so copper-covered steel, is really cheap and works out well for long antennas.

One last item worth passing on. During my years of writing about antennas I have had many requests to describe "invisible" antennas, particularly dipoles. Many amateurs do not realize that dipoles made from small-diameter wire make excellent antennas. No. 28 solid copper can be used (Yes, it will easily handle a kilowatt!). It is usually strong enough to withstand windstorms, probably because it offers such low wind resistance. Of course, the trick with such an antenna is getting it to support the coax feed line. I know of one amateur who was in college who managed to drive a hook into a power pole (of course safely below the power line). He then ran his coax out along the ground and buried it slightly below the grass. He then fed some nylon fishing line through the hook on the pole to use as his pulley line. He ran his dipole, made from No. 28, in an inverted Vee configuration and tied the ends of his antenna off to nearby trees. For all practical purposes, the antenna was invisible.

Amateurs at one time were very imaginative, so let your mind roam and see what you can build. It can be a lot of fun.

Let's talk a little about dipole impedances. I'll try to keep it as clear as possible. Let's assume we make a dipole for 40 meters and we are lucky enough to get that antenna at exactly the correct height so that the impedance is right on the nose at 50 ohms. We are happy to have an antenna that is perfectly resonant, so our feed point looks like a 50 ohm resistor.

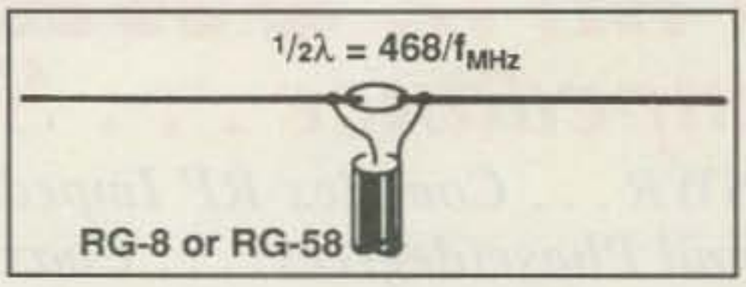

Fig. 1– A standard one-half wavelength dipole. The impedance of such an antenna will depend on its height above ground, but it should be somewhere between 25 and 100 ohms.

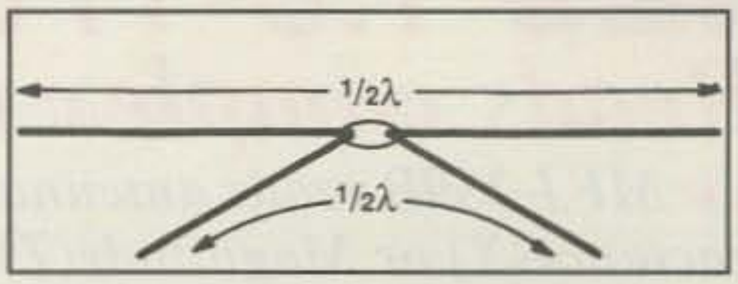

Fig. 2– Here we have two dipoles. As explained in the text, both of these antennas will work for you when fed with 50 ohm coaxial line.

Our standing-wave ratio would be exactly 1 to 1, or 50 ohms divided into a 50 ohm impedance. If we stay on this matched frequency (don't QSY), we will have a perfectly matched condition and our transceiver will love it. However, when we change frequency, we introduce something called "reactance."

Trying to explain reactance isn't easy, because it is a resistance that is not a resistance. Reactance is listed in ohms, and it really acts, to oversimplify, like a gate or a door that stops the flow of power into a circuit—in this case, the antenna. In the case of the antenna, if the antenna is too long for a frequency, it will exhibit what is known as inductive reactance. If it is too short, the antenna will have capacitive reactance. What this does is change the perfect 1 to 1 match to something else.

You'll see the term "SWR bandwidth" in antenna system advertisements. For example, such ads might show an antenna system with a 200 kHz of 3 to 1. Simply, this means that the system will not exceed an SWR (standing wave ratio) of more than 3 to 1 across the 200 kiloHertz. We have determined the impedance of our dipole. What else must we consider?

What we have to think about now—and it isn't too technical to understand—is tying more than one band to another with a common feed line. Fig. 1 shows a single dipole. Fig. 2 shows two dipoles; let's say one is for 40 and the other is for 80. We use 50 ohm coax. Actually, RG58 is suitable for these bands simply because the coax isn't too lossy at these frequencies (more about that in a moment). Let's assume that we have managed to get a dipole impedance on the 80 meter antenna of somewhere close to 50 ohms. Across this feed point we hang on our 40 meter dipole. When we go on 80 meters, our transmitter is going to see a load that it can work into without being affected too much. The 40 meter dipole is going to be highly reactive to our 80 meter portion and is not likely to take any power. When we switch to 40, we now see another 50 ohm load, or something close to it. However, on 80, our 40 meter signal is looking at somewhere around 4000 ohms plus a lot of reactance. Therefore, our signal goes into the more reasonable impedance of the 40 meter dipole.

I said earlier that I would discuss bandwidth and SWR. A lot of amateurs realize that good bandwidth and SWR are very hard to come by on 80 or 160 meters. Many newcomers don't realize why this is so. The following example shows us why this is true.

The 80 meter band is 3500 to 4000 kHz, or 500 kHz in width. Divide 4000 by 500, and we come up with a ratio of 8 to 1. If we use the low end, the ratio is 7 to 1. Now let's look at the ratio on 20 meters (14,000 to 14,350 kHz). We have a band that is 350 kHz wide. Divide 14,350 by 350, and we have a ratio of about 40 to 1. Therefore, when we move across 20, we have a

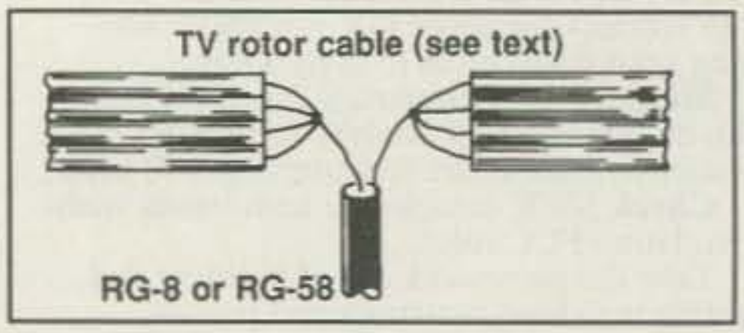

Fig. 3– TV rotor cable makes good multiband dipoles when fed with a single coax. Many configurations are possible.

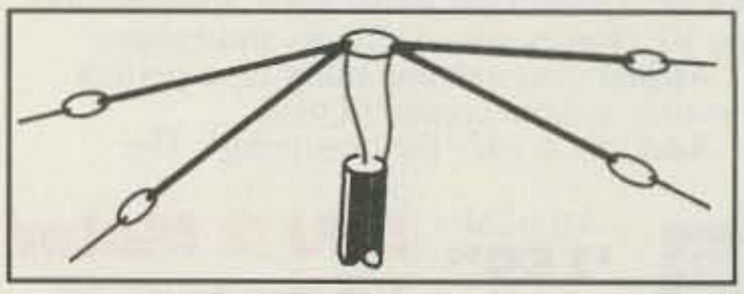

Fig. 4– Don't be afraid to run multiband dipoles off in different directions to suit your location. They will work for you.

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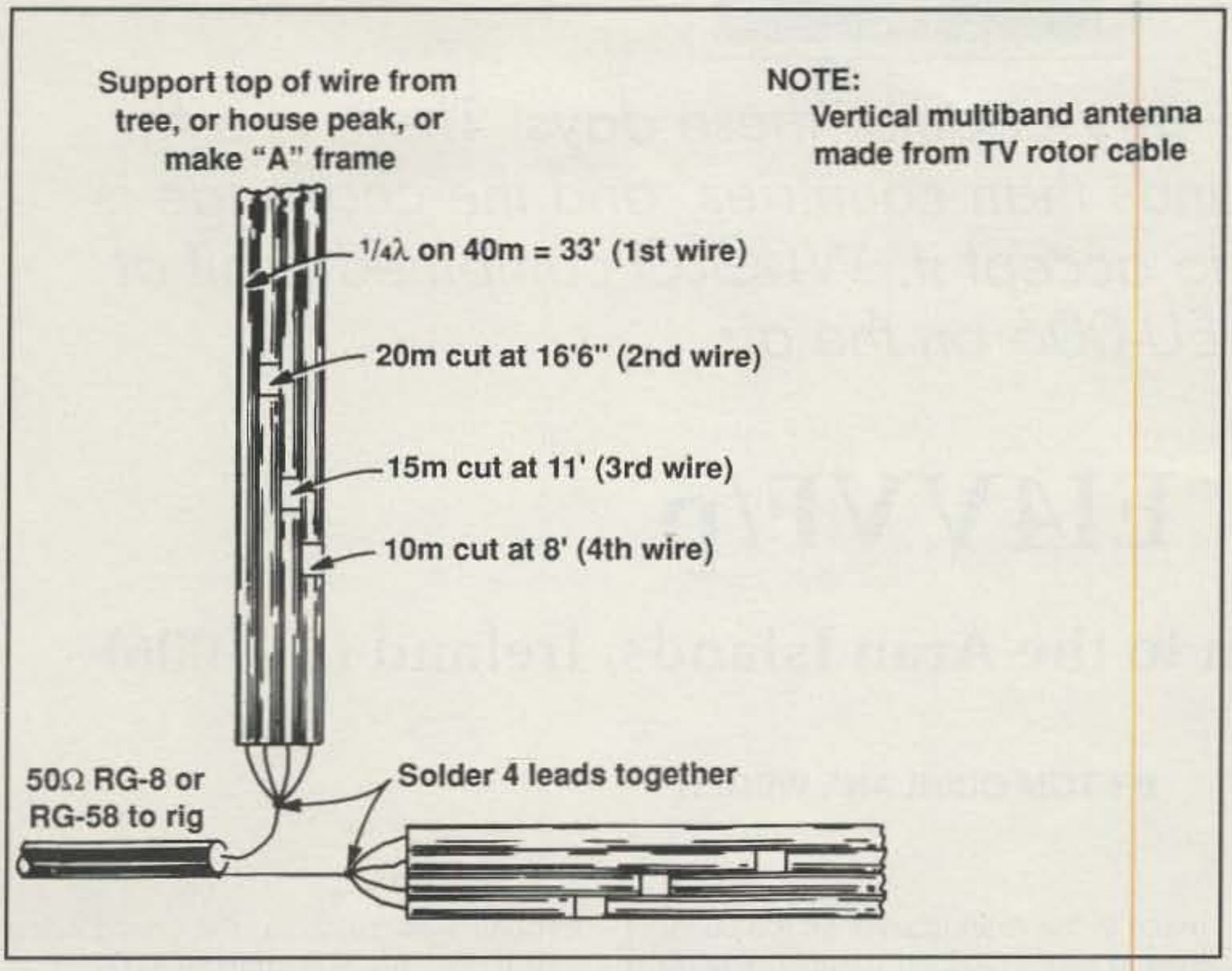

Fig. 5– This is a very good multiband vertical, and one that does not suffer trap losses. It is cheap, easy to make, and a very good performer.

rather small change to deal with. Usually, a dipole for 20 will have 2 to 1 SWR bandwidth or very close to it. But on 80, with our 8 to 1 ratio, the SWR can be very high, running from as much as 10 to 1 at the low end, down to 1 to 1, and then back up to 10 to 1 at the other end of the band. This is why many amateurs have spent years trying to design a broad-band 80 meter antenna that will stay below 2 to 1 across the band. It hasn't been done.

Getting back to actual construction, any handbook shows how to make a simple "A" frame as a single support for wire antennas. If you cannot manage an "A "frame, you may be able to mount a single two by four up on the end of the house, putting a line and pulley at the top. (On holidays I ran the Stars and Stripes up, which kept the neighbors from complaining—Hi!).

In the course of my career, I have tried bunching all the dipoles together. By that I mean the wires are side by side yet insulated from each other.

In fact, one suggestion is to obtain TV rotor cable, the flat type with four conductors (see fig. 3). Don't strip each dipole away from the main stock. Carefully measure from your center point and then cut the end of each dipole. Take out about one inch of the insulating material and wire, leaving the rest intact. Keep in mind that RF voltages get quite high at the ends of antennas, so you need enough space to keep the the arcs from jumping. In fact, I would suggest using electrician's tape to cover each cut-away portion.

I remember one case where I was trying to make an 80 meter dipole that would be fairly flat for SWR across the entire 80 meter band—from 3500 kHz to 4000 kHz (and that ain't easy!). I figured that I could make two dipoles, one cut for 3500 kHz and the other cut for 4000 kHz. Unfortunately, it didn't work worth a darn. What happened was that the longer dipole took over and cancelled out any advantage of the shorter dipole. This accident of course led to a tremendous amount of experimenting. To avoid interaction between dipoles, I found that it helped to separate the ends as shown in fig. 4. Don't misunderstand. Several bands all in one line such as with TV rotor cable will work fine, but the SWR can be improved by separating the ends as much as possible. It would be nice if there were a hard and fast rule one could follow to get repeatable results. Unfortunately, ground conditions, height of the antennas, whether the antennas are inverted Vee style or horizontal, all these things get into the act and can foul up the best of plans. However, even under bad conditions the multiple dipole makes a very inexpensive, good antenna.

One last thing worth thinking about: If you have limited space, you can make a single-feed, multi-band vertical. A 30 foot high "A" frame would take care of 40 through 10 meters. Believe it or not, such a vertical, shown fig. 5 , is as good as or better than some of the trap verticals on the market today.

I once made one for 20 through 10 meters using a 16 foot two by two to support the wires, and I used TV rotor cable for the three bands (at that time 20, 15, and 10). At the base I ran a single length of rotor cable with the three bands cut out, and just laid it on the ground for my other half of the antenna. The darn thing worked like a charm. Fig. 5 illustrates this. If you want, you can call that bottom length the "ground plane," but it really shows the vertical as a half-wave dipole, one part horizontal while the other half is vertical. Believe it or not, years ago when I lived in the Ozarks of Missouri, I built one of these and worked DXCC with it. Try it. You'll save lots of buck and work lots of DX. ■

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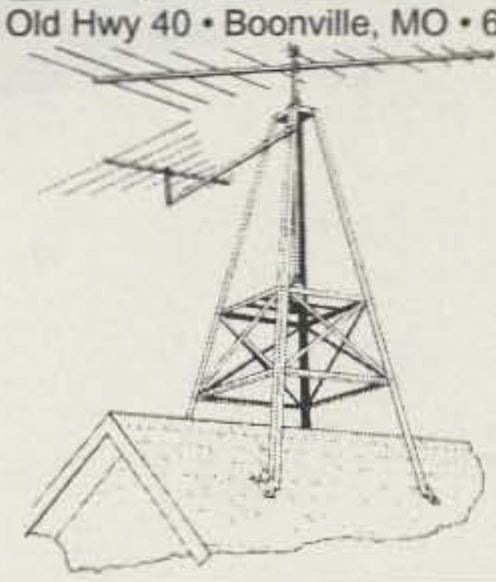

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IOTA DXpeditions are very popular these days. There is a far greater number of islands than countries, and the challenge is there for those ready to accept it. WØGLG combined a bit of vacation with putting EU-006 on the air.

EI4VVF/p

IOTA DXpedition to the Aran Islands, Ireland (EU-006)

BY TOM QUINLAN*, WØGLG

In mid-July last year my wife Glenys and I went on a mini-DXpedition to a small cottage on Inishmaan Island, which is part of the Aran Island group. For two weeks, in spite of poor weather and even poorer propagation conditions, we managed to confirm a lot of EU-006 contacts for Island Hunters. The operation was basically on three bands—20, 40, and 75 meters. The primary frequency was 14.260 MHz, but because of crowded band conditions I was spread out anyplace from 14.250 to 14.270 and 7.045 to 7.065 MHz.

Getting the station from the home QTH of Conifer, Colorado to the Island of Inishmaan in the Aran Islands off the coast of Ireland was a logistics miracle. The rig, a Kenwood 570-D, and its back-up, a Kenwood TS-50, plus power supplies and amplifier, an Ameritron AL-811 with spare parts, an antenna tuner, a two-element Hy-Gain TH-2 MK-3 beam for 10-15-20, a Hustler vertical, a collapsible 15 foot mast to hold up the beam, and finally a G5RV wire antenna all had to be packed carefully. All the gear fit into Samsonite luggage and a golf bag case with wheels. The Kenwood rigs fit into a backpack and were never far from me. The amplifier had a special fiberglass traveling case with wheels and a pull-up handle. The box was filled with semi-rigid foam. The luggage totaled eleven pieces. When I came through Irish customs, the young agent asked me, "Are you immigrating?"

The island, Inishmaan, is the middle island of three located about 30 miles from Galway in the west of Ireland. There are no trees, and the soil only goes down four or five inches. All the soil on the island was either brought in or made from mixing sand and seaweed. There is an abundance of rocks on the island, and they are used for everything from making fences to building houses and barns.

The cottage we rented was small and simple. It had running water and heat, a flush toilet, and a propane range. The most important aspect for me, however, was an abundance of 220 VAC electricity with available outlets.

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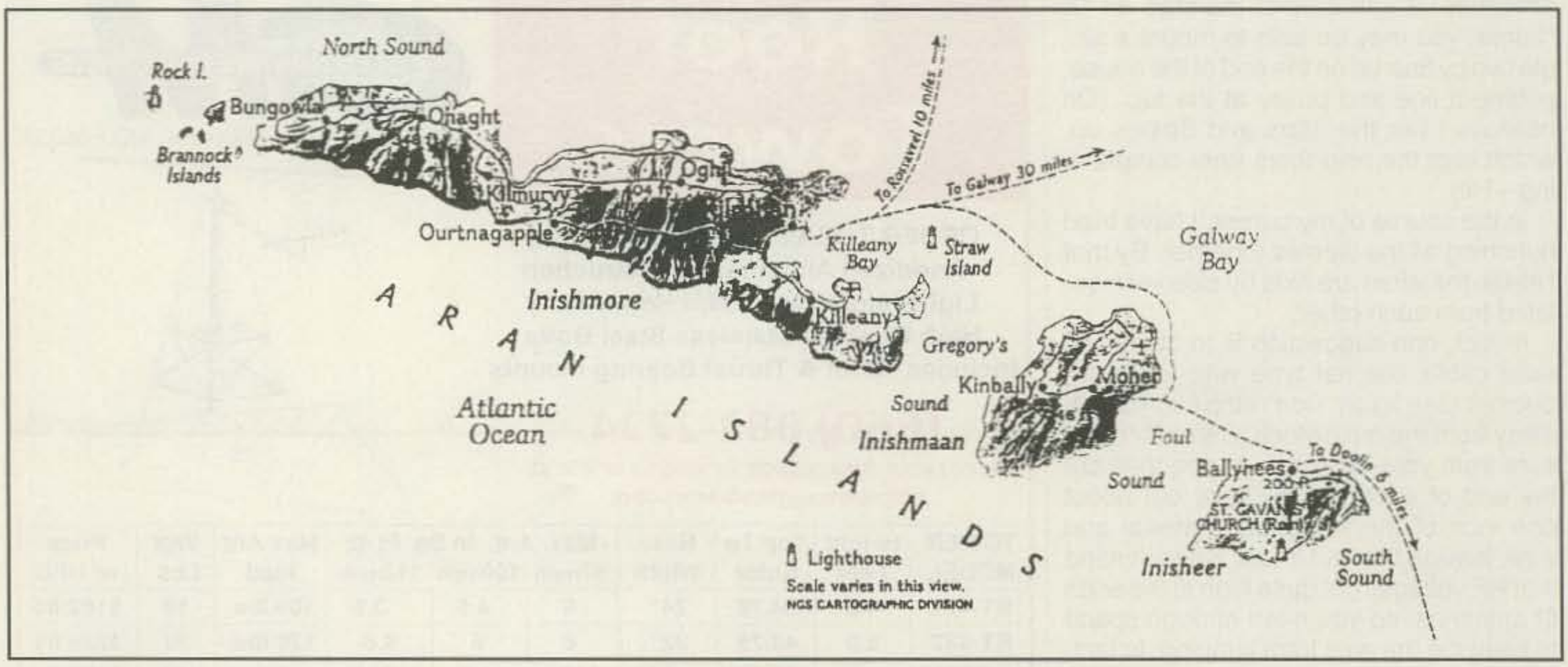

The Aran Islands group, EU-006, off the coast of Ireland.

With the Atlantic Ocean in the background and a Hy-Gain TH2-MK3 10–15 and 20 meter beam in the foreground, Tom, EI4VVF/p on Inishmaan Island, Aran Islands EU-006, enjoys a "pint" to celebrate over 3,000 QSOs.

The weather was a constant problem, but I was lucky to get the beam and the G5RV up before the really bad weather settled in. I worked the pile-ups as fast as I could, and when the band crashed, the XYL and I put on our foul-weather gear and headed for the "pub." There you could enjoy soup and sandwich and a pint of your favorite adult beverage.

Band conditions were not great; solar flux and indices left a lot to be desired. I played the cards I had, though, and filled page after page with contacts.

Upon entering Ireland, I had purchased a cell phone. When someone told me he was putting me up on the packet as a DX spot, I gave him my international cell phone number. Before long, I was getting requests via the cell phone for schedules at a particular time and frequency. Some stations that really wanted the IOTA contact from EU-006 could not bust into the pile-up because of low power. I tried to remember to set aside a few minutes at the end of the hour for QRP stations, but at times the pile-ups were overpowering.

At the end of our stay, and after only 46 hours of operation, we had 3,367 contacts in the log books. Upon our arrival back in Conifer, Colorado, we found a shoe box full of cards waiting for us.

If you're looking for fun and excitement during your next vacation, try putting an island on the air. ■

Tom Quinlan, WØGLG, at the operating position of EI4VVF/p EU-006 IOTA, Inishmaan Island, for a two-week mini DXpedition.

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CIRCLE 87 ON READER SERVICE CARD

Here's a very clever project that's easy to build. It can be especially handy during emergencies, special events, and field day operations. It might even make a good club project.

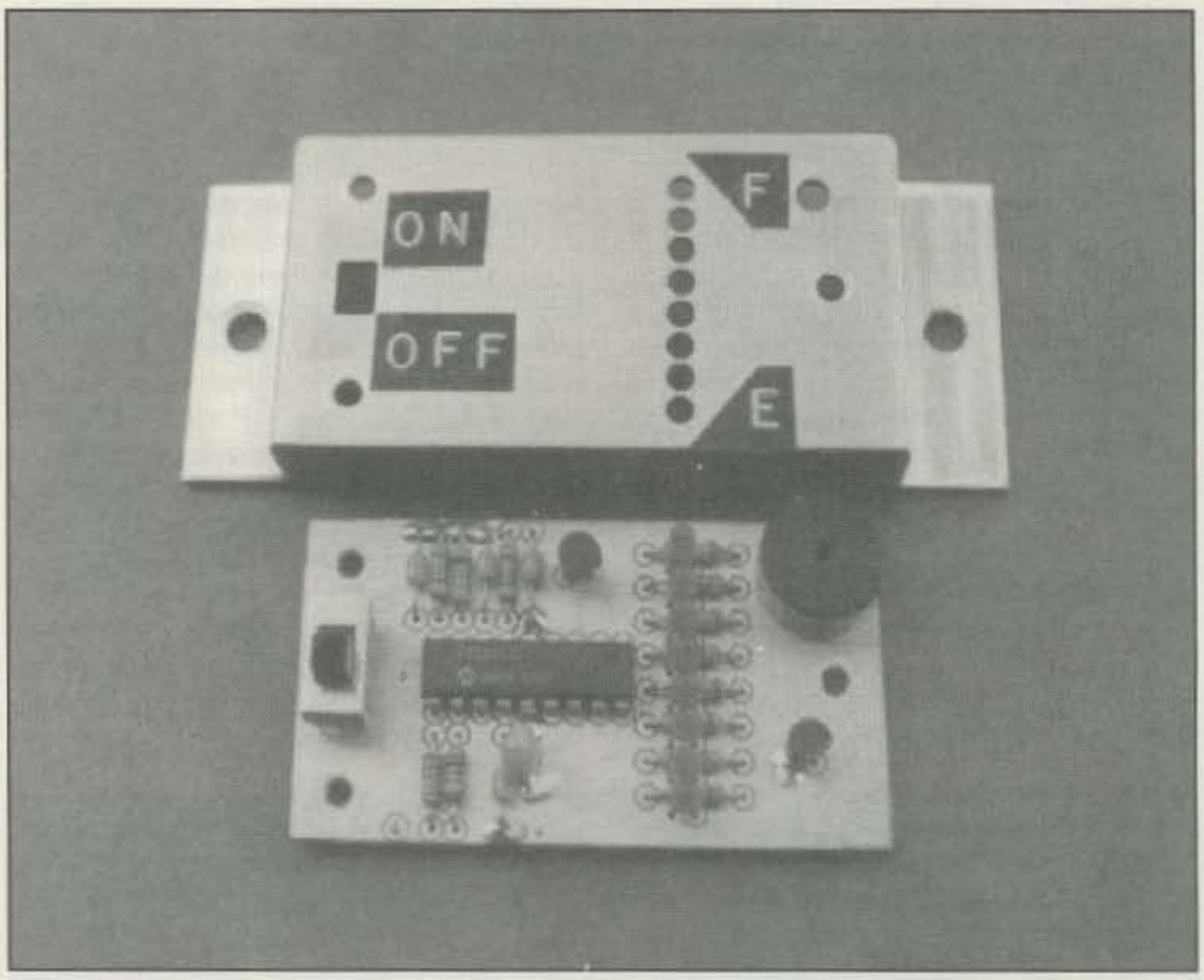
How To Make A Lead Acid Battery Voltage Monitor

BY DEREK TOEPPEN*, WAØZTI

A number of years ago, we put together a transportable 2 meter repeater system to support local amateurs in special events and emergencies. This system has two 85 amp-hr lead acid batteries as its power source. Two batteries are provided so they can be rotated between supplying power to the repeater and being recharged during extended operations. One of the responsibilities of the person deploying the repeater system is determining when a battery is fully discharged and swapping in a fresh one. This is a critical responsibility, because if batteries are swapped too soon, they are not being used to their maximum potential. If they are swapped too late, they are discharged too far and can be damaged. To determine when to replace a battery, the operator needs a way to measure the battery's voltage.

Adding a voltmeter to the repeater's list of equipment was one way to provide this capability. However, that had its disadvantages. It would require that the operator have knowledge of the battery's fully charged and fully discharged voltage levels in order to interpret the voltage reading. It would require connecting the meter leads to the battery to get a reading. In addition, it would add one more piece of equipment that would have to be kept track of and maintained with the system.

A more desirable solution was to have a simple voltage monitor permanently attached to each of the batteries. Where ever the battery would go, so would a monitor. The device would tell the operator when the battery was fully discharged without knowing the battery's actual voltage. It would need to be small to fit on the battery, inexpensive so one could be placed on each battery, and have low power consumption so it could draw its power from the battery it was monitoring without reducing the battery's operating time.



Completed voltage monitor circuit board and simple sheet-metal cover used to mount it to a battery. Note the top and bottom of the bar graph display is labeled with the universally recognized "F" and "E."

This article describes the design of a voltage monitor implemented for the transportable repeater system. Although this voltage monitor was designed for the high-capacity repeater system's batteries, its small size and low power consumption make it useful in a number of amateur applications and battery sizes. For example, it could also be used to monitor the back-up power source in a radio shack, to monitor the battery used to power the radio in a camper, or perhaps to monitor the small battery used to power a QRP rig on a backpacking trip.

Monitor Operation

The monitor developed is shown in the photo. The user interface consists of a

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light emitting diode (LED) bar graph display, an on/off switch, and an audio tone generator. The on/off switch controls power to the monitor. The bar graph display is a voltage readout. However, no attempt was made to tie voltage values to each LED. Instead, the bottom of the bar graph indicates a fully discharged battery. The top of the bar graph indicates a fully charged battery. Or, put another way, when all the LEDs are lit, the battery is fully charged. When all the LEDs go out, it is time to swap the battery. Further, as the battery is discharging, the number of LEDs lit decreases and the bar graph gives the operator a simple graphical indication of how much charge is left in the battery. The audio tone generator provides an alarm when the last LED goes out so the operator does not have to continuously watch the display.

The monitor has four modes of operation. The operator has no direct control over the modes. When the monitor is switched on, it automatically moves between the four modes in the order that is listed below.

Self test mode. The first mode is a self-test. In this mode each LED in the bar graph will light, one at a time, and the tone generator will sound momentarily. The purpose of the self test is to tell the operator that the monitor is working. Without it, if a monitor is powered up and there is no display, it is not immediately obvious whether the monitor has failed or the battery is simply fully discharged.

Monitor and display mode. After self test, the monitor moves to the monitor and display mode. In this mode, the monitor is reading the battery voltage once every couple of seconds and displaying the voltage on the bar graph.

Monitor without display mode. After being in the monitor and display mode for about 45 seconds, it moves into the monitor without display mode. In this mode, the monitor is reading the battery voltage once every couple of seconds, but it does not display anything on the bar graph. The purpose of this mode is to conserve battery power. It takes a respectable amount of current to light the LEDs. By turning them off, the current drawn from the battery is reduced to a few hundred micro amperes. This means the monitor has virtually no effect on the battery life and can therefore be left powered up continuously during deployment. But what good is a monitor without a display? That is where the tone generator comes in.

Alarm mode. Any time during the monitor and display or monitor without display modes, if the battery voltage drops low enough to turn off the last LED, the monitor enters the alarm mode. In this mode, the audio tone generator pulses on and

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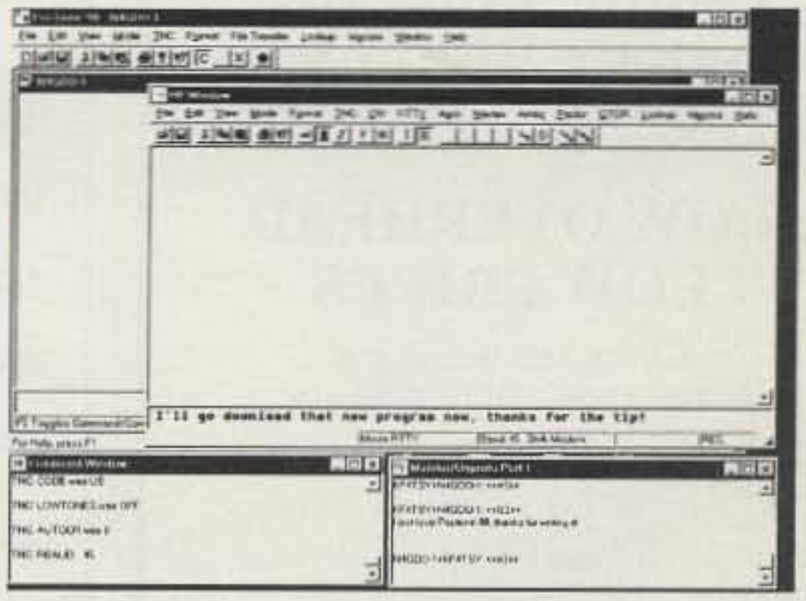

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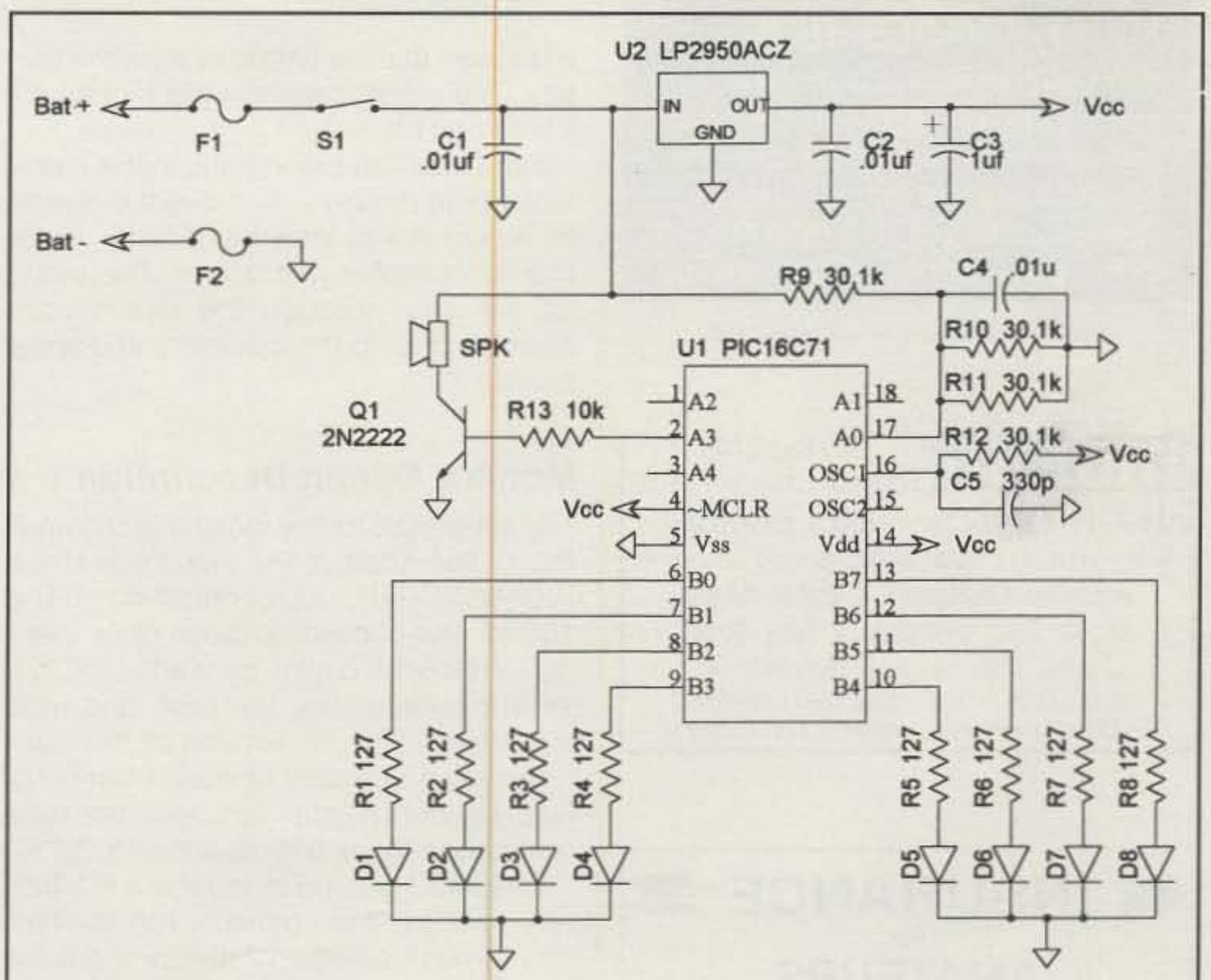

Materials List

C1, C2, C4	0.01 µF	R13	10k 1/8 watt 1%
C3	1 µF electrolytic 10 V	S1	SPDT switch
C5	330 pF 5% CGO	SPK	Piezo Electric Buzzer RS273-074 (Radio Shack)
D1–D8	LED		
F1–F2	1 amp pico fuse	U1	PIC16C71-04I MPU (Digi-Key)
R1–R8	127 ohm 1/8 watt 1%	U2	LP2950ACZ-5 Regulator (Digi-Key)
R9–R12	30.1k 1/8 watt 1% (3 matched to 0.1%, see text)	Q1	2N2222 Switching transistor

Fig. 1– Schematic diagram of the voltage monitor.

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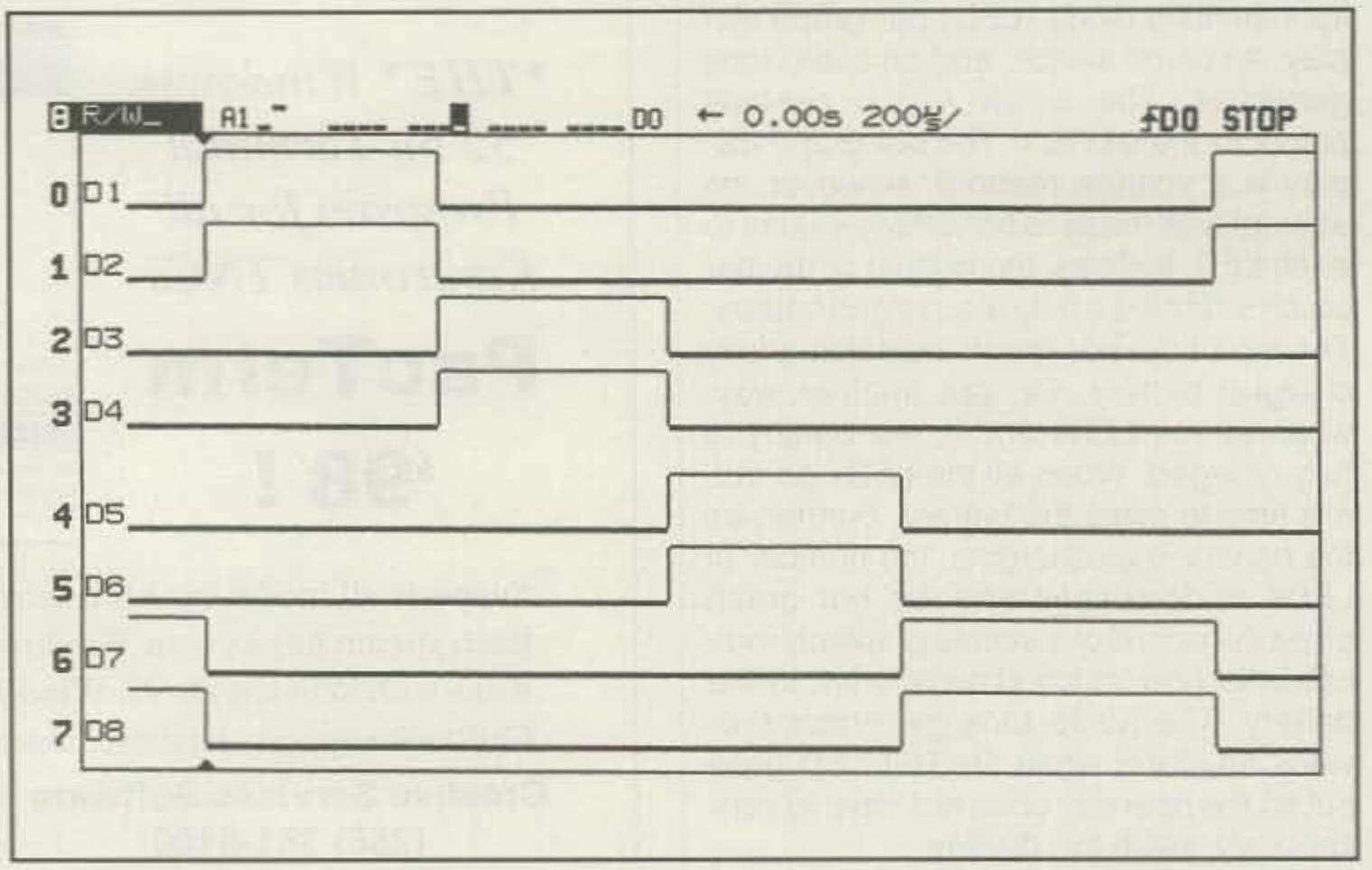

Fig. 2– Logic timing analyzer plot of the LED drive signals (pins 6–13 of U1) illustrating the multiplexing of the LEDs in the bar graph display. An LED is on when its drive length is high. Note that only two LEDs are on at any given time. However, when viewed by the human eye, all eight will appear continuously lit (see text).

off to warn that it is time to replace the battery. The monitor stays in this mode until it is turned off.

Note that if the monitor is in the monitor without display mode and the operator would like to view the display, he or she can simply cycle power. The monitor will start through the four modes again, including the monitor and display mode.

Monitor Circuit Description

The schematic for the monitor is shown in fig. 1. The heart of the monitor is U1, a PIC16C71-04I microcontroller.[1] The 16C71 was chosen because of its internal analog to digital converter (ADC), small package size, low cost, and wide availability. The "I" version of the controller is an extended operation temperature version. The standard operation temperature range is only specified to 32°F.

The ADC is used to measure the battery voltage. It is connected to the battery through a resistive divider made up of R9, R10, and R11. The divider reduces the battery voltage by one third. This brings it into the 0 to 5 volt range of the ADC. With an ADC range of 0 to 5 volts and a divider of one third, the battery voltage range is 0 to 15 volts. Having the voltage range go as high as 15 volts is important because when the battery is being charged, its voltage can be as high as 14.8 volts and voltages outside the microcontroller's ADC input range can damage the controller.

The accuracy of the resistive divider contributes directly to the accuracy of the voltage measurement, so precision 0.1% resistors would be appropriate. However, they can be a little expensive. Therefore, a means of using 1% resistors was devised, which is why the divider is made up of three resistors when only two would do the job.

What is needed for the one-third divider is one resistor of value R and one of value R/2. In this divider the R/2 resistor is made by paralleling two resistors of value R. Thus, all three resistors have the same value. To enhance the accuracy of the divider, a dozen 1% resistors (about the cost of one 0.1% resistor) were tested, and three that matched to within a tenth of a percent were used. This creates a divider accurate to within 0.13%. However, in addition to initial resistor tolerance, there is temperature drift to be considered. True 0.1% resistors will have a temperature coefficient of ±25 ppm/°C, whereas 1% resistors are 50 to 100 ppm/°C. However, 100 ppm/°C will yield a drift of only 0.42% down to 0°F. (It was felt this was an adequate low temperature point, as the performance of the batteries will suffer at low temperatures, not to mention the suffering of the operator deploying the repeater at that temperature.) In addition, since all three resistors in the divider are the same value, they should have similar thermal drift characteristics. Thus, the resistor drifts will tend to cancel. With this in mind, the use of selected 1% resistors seemed acceptable.

To reduce the load the divider presents to the battery, 30k resistors were select-

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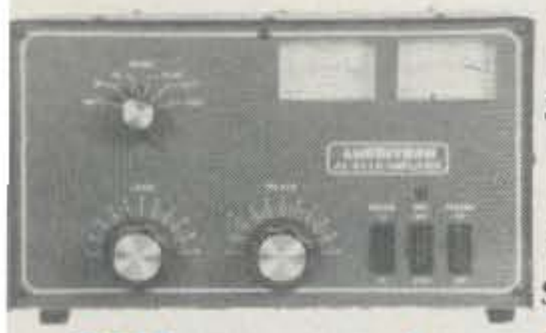

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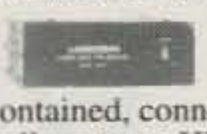

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ed. Even with 30k resistors, the current in the divider is the largest contributor to battery drain when the monitor is in the monitor without display mode (266.7 µa when the battery is 12 volts). Larger resistor values cannot be used because the microcontroller manufacturer recommends a maximum source resistance of 10k for driving the ADC.[2] Circuits to connect the battery to the divider only when an ADC reading was being taken were considered. However, they added cost to the monitor, so they were not included.

The bar graph display is made up of eight LEDs (D1–D8). They are driven directly from U1 though current limiting resistors (R1–R8). The resistors provide 15 ma of peak diode current.

The tone generator (SPK) is driven through transistor Q1. Q1 provides the current and voltage drive capability necessary to drive the tone generator. R13 in the base of Q1 provides current limiting.

The microcontroller clock is generated with a RC oscillator made up of R12 and C5. This provides a 100 kHz clock frequency. The down side of using an RC oscillator is that it is not as stable as a crystal.It is very inexpensive, though, and in this application timing accuracy is not important. The choice of 100 kHz was heavily influenced by power consumption, since the higher the clock frequency, the more current U1 requires.[3]

The 5 volt supply required for U1 is created with a LP2950 regulator (U2). The LP2950 was chosen because of its accuracy. This is important because the accuracy of the ADC is tied directly to the supply voltage accuracy. The LP2950ACZ is 0.5% accurate. Another bonus of the LP2950 is its low quiescent current requirement of 90 µa.

Fuses F1 and F2 are added to the installation to limit current into the monitor should a short occur. Remember the battery it is monitoring can provide 600 amps of cranking current! A 1 amp fuse was chosen, even though the maximum current required by the controller is much smaller, because small current fuses can have rather large series resistance. One 1/4 amp fuse had 0.65 ohms of series resistance, whereas a 1 amp had 0.13 ohms. This resistance will cause a voltage drop between the battery and the monitor, resulting in measurement offsets.

Monitor Firmware Description

The firmware used by U1 is set up to periodically measure the battery voltage and display the voltage or sound the alarm. But the way it does these things plays a very important role in how much current the monitor draws. As a result, the firmware was implemented very carefully in several places to lower the current draw of the monitor.

One of these places is in the LED displays. Because of the way the eye responds to light, when an LED is pulsed on and off it appears brighter than if it were driven continuously with the same average current.[2] Thus, for a given LED brightness, less current is required if the LED is pulsed. It was determined, through experimentation, that if the LEDs were pulsed with 15 ma at a 25% duty cycle, the same brightness was achieved as with a 7.5 ma continuous current. So instead of just turning on the LEDs and burning 60 ma (7.5 ma per LED times 8 LEDs), the firmware pulses the LEDs on and off. This is illustrated in fig. 2. Note that only two LEDs are on at a time. D1 and D2 are turned on for several hundred microseconds and then turned off. Immediately after D1 and D2 are turned off, D3 and D4 are turned on for several hundred microseconds and then turned off. This pattern continues until all eight have been turned on. It takes about 1.6 milliseconds to light all eight diodes. Once all eight diodes are lit, the pattern repeats. With each diode using 15 ma and only two on at a time, only 30 ma of current is required. This a 2 to 1 savings in current.

The observant reader will note that D7 and D8 are on a little longer than the other six diodes. This is because of some extra instructions needed to start the pattern over again and is a drawback of a low clock frequency. The effect cannot be seen in the LED brightness.

Another place where the firmware contributes to power consumption is during the monitor without display mode. In this mode, the monitor reads the voltage every few seconds but does not display it. In between measurements, U1 has nothing to do, so it is put in the sleep mode[3] between measurements. In the sleep mode, its clock stops and it requires very little current. An internal timer wakes it up in time to make another measurement, and if the alarm is not required, it goes back to sleep again. Although U1 requires full current during the measurement, the measurement does not take very long compared to the time between measurements. As a result, the average current draw is a very low 8 µa.

The final contribution to power conservation made by firmware is when the alarm sounds. Rather than just turning on the tone, it is pulsed on and off with a 40% duty cycle. This cuts power consumption by 60%. The pulsing tone also helps get an operator's attention.

The firmware also sets the voltages at which the LEDs light. As a rule, lead acid batteries can be discharged to 10.5 volts. Further, their fully charged (no load) volt-

The completed monitors are small enough and inexpensive to build so that you can include one with every portable power source.

age is 12.7 volts.[4] In the monitor's bar graph display, the first LED lights at 10.6 volts. The last one lights at 12.7 volts. For those counting, that means each LED represents about 300 mv. For the first LED 10.6 volts was chosen, rather than 10.5 volts, to compensate for measurement accuracy of the monitor and prevent the actual set point of the first LED from getting too far below 10.5 volts.

Conclusion

Two voltage monitors were built and tested for the repeater system batteries. They were put together for about $15 each. The majority of cost is in the microcontroller (U1), the regulator (U2), and the tone generator (SPK). Looking in your scrap box and shopping in your favorite surplus parts store can help reduce the cost.

The current draw of the monitors in the monitor without display mode was predicted, from data sheets, to be 364 µa. Both monitors draw less than 366 µa. If the monitor were the only load on the 85 amp-hr repeater system batteries, it would take some 27 years to discharge a battery. Clearly, the monitor will not reduce the operating time of these large batteries. However, note that if used on a 3 amp-hr battery, it would still take about a year for the monitor to discharge the battery by itself. Thus, it is useful even on small, light-weight batteries.

The data sheets predict the accuracy of the monitor at room temperature should be around 1%. However, these two were better than 0.5% accurate. This is attributed to U1 and U2 exceeding their published specifications. Another 1% error should be expected as the temperature drops to 0°F.

Keep in mind also that although this monitor was designed for 12 volt lead acid batteries, it is a simple matter of changing the LED set points and perhaps changing the divider to modify the monitor to other battery voltages and technologies, such as 6 volt batteries or nickel cadmium batteries. ■

References

1. Microchip Technology Inc., 2355 West Chandler Blvd., Chandler, AZ 85224-6199 (phone 602-786-7200; <http:/www.microchip.com>).

2. "Multiplexing LED Displays," Appnote 3, by George Smith, *Siemens Optoelectronics Data Book 1993–1994.*

3. *PIC16/17 Microcontroller Data Book* <http:/www.microchip.com>.

4. *Standard Handbook for Electrical Engineers,* Fink and Beaty, Eleventh Edition, McGraw-Hill, pp. 11–112 to 11–118.

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It's easy, it's simple, and most important, it works. VE3ERP once again comes through with another project that can help us get on the air more quickly so we can have more fun.

The End-Fed Random-Wire Antenna

BY GEORGE MURPHY*, VE3ERP

How about this antenna? We already know the positives. What about the negatives and all the things we won't need anymore? The following is a list of the things we won't need anymore:

- NO minimum length (fits almost any available space)
- NO measuring
- NO pruning
- NO traps
- NO baluns
- NO hardware
- NO soldering
- NO feedline connectors
- NO feedline
- NO high SWR (always 1:1)
- NO cost, if you have some wire and a couple of insulators
- Can be strung straight, dog-legged, U–shaped, whatever . . .

It sounds too good to be true. But is it true? Yes.

Why is the end-fed random-wire antenna not more widely used? It is a matter of shrift. Traditionally, writers of amateur radio literature have always made short shrift of this antenna. I intend to make longer shrift of it by raising public awareness of its excellent properties.

A Story Goes With It

Over nearly 40 years I have operated from many QTHs. In every case, the first antenna I put up immediately upon arrival was an end-fed random wire. It only took a few minutes, and I was on the air almost as soon as the tubes in my QRP rig had warmed up.

Usually I eventually got around to installing a more exotic antenna, but I *always* left the random wire in place. Since there was nothing in it to go wrong, it made a good reference standard for evaluating any subsequent fancy-shmantzy antenna in which everything could (and frequently did) go wrong. Besides, an end-fed random wire often makes a better omni-directional receiving antenna than anything else on the antenna farm.

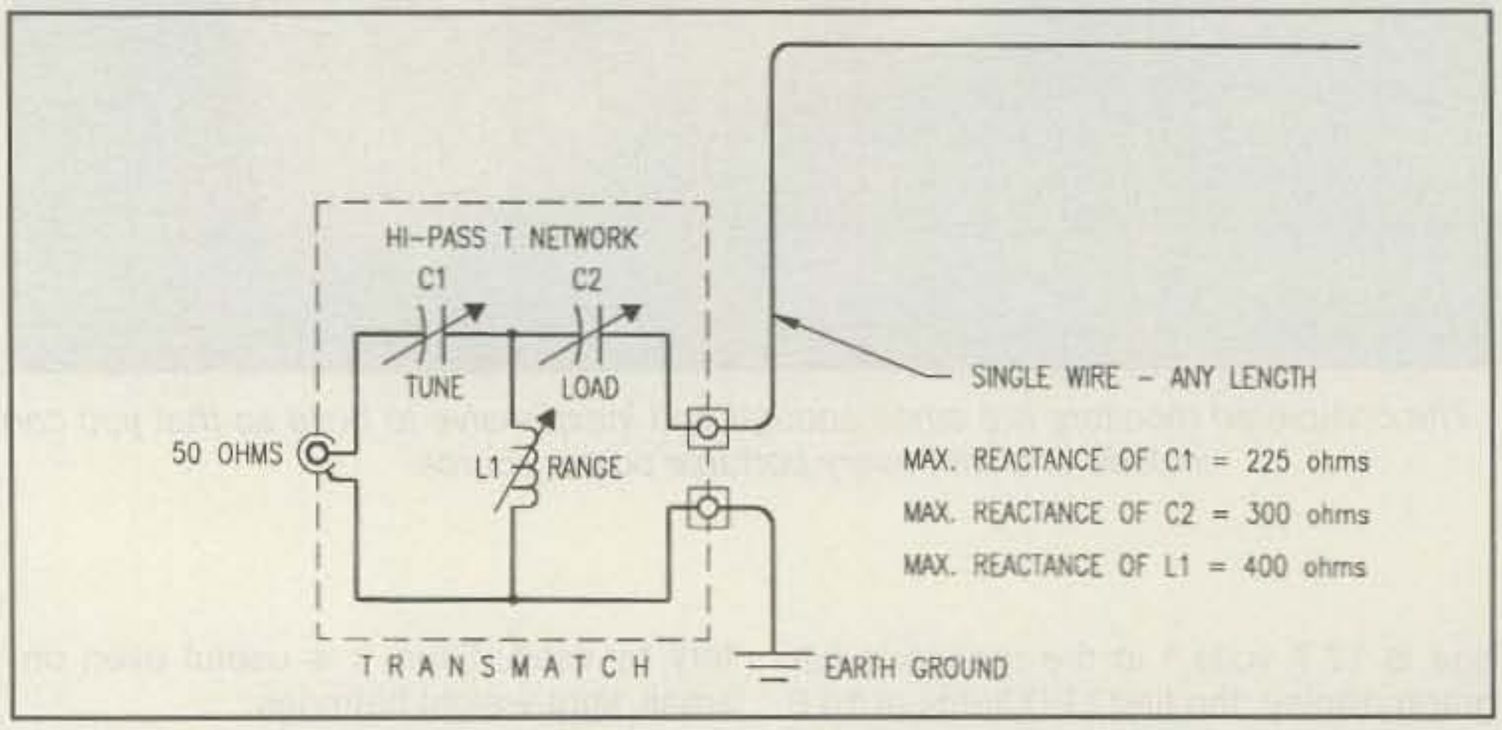

Fig. 1– The end-fed random-wire antenna is shown with a simple transmatch.

What Are Its Shortcomings?

Hardly any. A transmatch is an absolute necessity. However, a transmatch should be used with *any* antenna. Why else would most current high-end commercial rigs have them built in, even though they are sometimes called the misnomer "antenna tuner"? Anyone who thinks the impedance at the input end of their feedline is a perfect match to the output impedance of their rig is living in la–la land.

The input impedance of a random wire antenna may range anywhere from 10 ohms to 2000 ohms. By its very nature, an end-fed single-wire antenna produces RF in the shack, since it starts radiating right at the transmatch. It is always a good idea to route the antenna wire away from RF-sensitive devices, but there should be no problem if all equipment in the shack is properly grounded and the transmatch is adjusted for 1:1 SWR. If possible, the ground terminal of the transmatch should go directly to a ground rod, but metal cold-water piping also works. Even if there are some plastic sections, there may be enough length of continuous metal to provide a usable counterpoise. In a high-rise hotel room if you can't get at the piping, a bed spring can provide an artificial ground, just as a car body does for a mobile whip. It's not great, but it's better than nothing.

How Efficient Is It?

A short random-wire antenna run along the ceiling in a basement apartment without a proper ground at the transmatch works better than a mobile antenna when the car is in a garage.

A random-wire antenna 1/4 wavelength or longer located 1/4 wavelength or more above ground level with a serious ground rod at the transmatch will work as well as or better than many dipoles, Zepps, and Windoms.

The most important fact about an end-fed random wire is that it always works. How well depends on how you follow these rules:

1. Outdoors is better than indoors.
2. High in the air is better than close to the ground.
3. Long is better than short.

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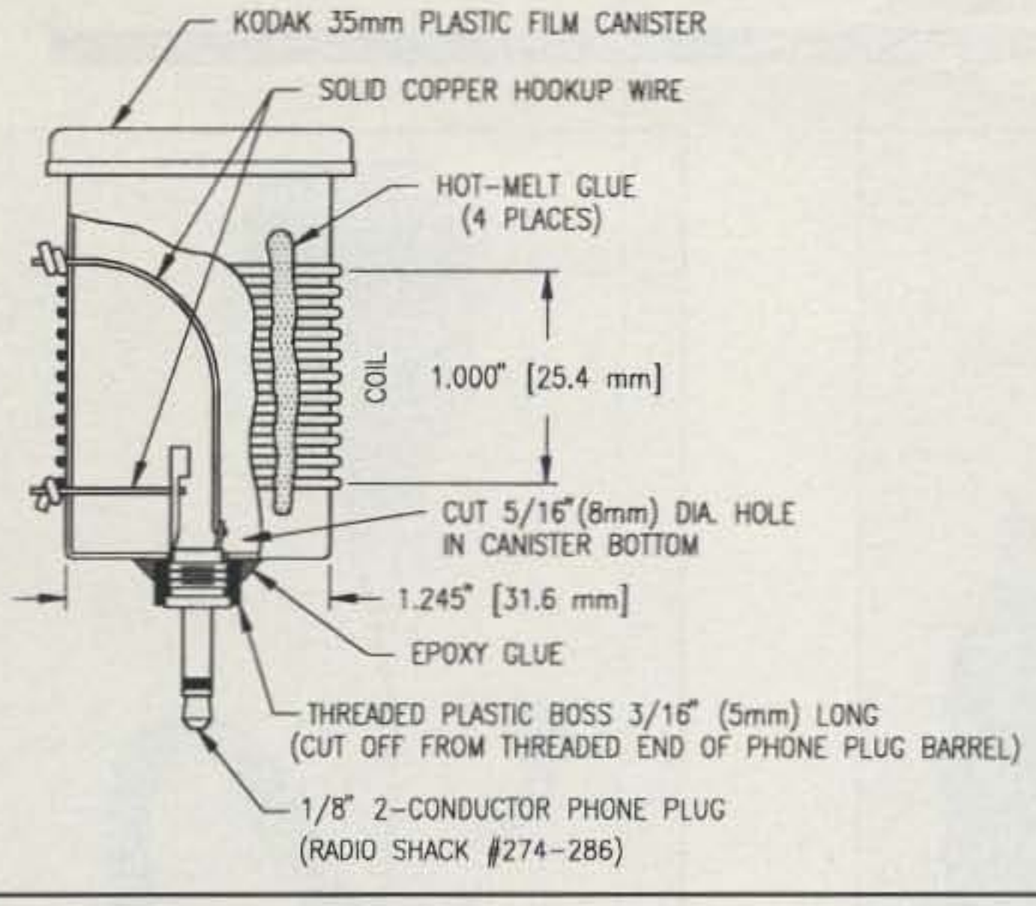


Fig. 2– A typical plug-in coil for QRP use.

APPROXIMATE LENGTH OF A 1/4 WAVELENGTH WIRE		BAND (m.)	QRP COIL DATA — ALL COILS #30 ENAMELLED COPPER WIRE WOUND ON 1.254" (31.6mm) Dia. FORM					CAPACITOR APPROXIMATE MAX. VALUES (pF)	
metres	feet		FREQ (MHz)	COIL uH	NO. TURNS	LENGTH inches	LENGTH mm	C1	C2
39.6	130.0	160	1.800	32.8	36	1.00	25.4	393	295
20.4	66.9	80	3.500	18.5	27			203	152
10.2	33.4	40	7.000	9.1	19			102	76
7.1	23.2	30	10.100	6.5	16			71	53
5.1	16.7	20	14.000	4.3	13			51	38
3.9	12.9	17	18.068	3.7	12			40	30
3.4	11.1	15	21.000	3.1	11			34	26
2.9	9.4	12	24.890	2.5	10			30	22
2.6	8.4	10	28.000	2.1	9			26	19

Fig. 3– A chart of QRP coil data so that you can wind your own. As you can see from fig. 2, it's a good thing you saved all those film canisters. They do come in handy.

4. The better the ground connection, the better the signal.

How Do You Work It?

You can use a commercial transmatch or build your own. In either case, hook up everything as shown in fig. 1. If you are using an in-line SWR bridge, install it between the rig and the transmatch.

Fig. 1 shows it all. C1 and C2 are variable capacitors. L1 is a variable inductor — a roller inductor if you are rich, a tapped coil and selector switch if you are not, or individual plug-in coils if you are, like me, too cheap to buy a switch. Tune the receiver to a signal close to your chosen operating frequency. Adjust L1 (or plug in the appropriate coil) for maximum signal strength. Tweak C1 and C2 to peak the signal.

To check the transmitted signal some sort of RF meter is required. If your transmitter has a meter that indicates SWR, RF output, or both, then you are in business. With my QRP rig (which is devoid of all unnecessary fripperies) I use an inexpensive field-strength/SWR meter (Radio Shack No. #21–523) which requires no connection to anything; it just sits somewhere in the shack and sniffs RF with its tiny antenna.

Tune up your transmitter into a dummy load. In CW mode put a carrier on the air for a few seconds and tweak C1 and C2 for maximum output and/or minimum SWR as shown on your meter. That's it. You are all set to work the world on a hank of wire.

Homebrewing A Random Wire Antenna System

All you need is a hank of wire, a couple of fleamarket air-spaced variable capacitors, a miniature 1/8 inch phone jack, and the wherewithal to construct a few plug-in coils[1] as shown in figs. 1, 2, and 3.[2] Solder the hookup wire leads to the phone plug before mounting it in the canister. When soldering the coil ends to the hookup wire leads, be quick and very careful, as the plastic canister melts easily!

If you want to design a single multi-band tapped coil and you have a computer, you can do it using *HAMCALC*[3] software programs "Single Wire Antenna Systems" and "Coil Equation Calculator" (these programs were used to compile fig.3).

Please note that neither side of either capacitor is connected to ground, so the capacitors need to be insulated from any metal chassis or enclosure.

In Conclusion . . .

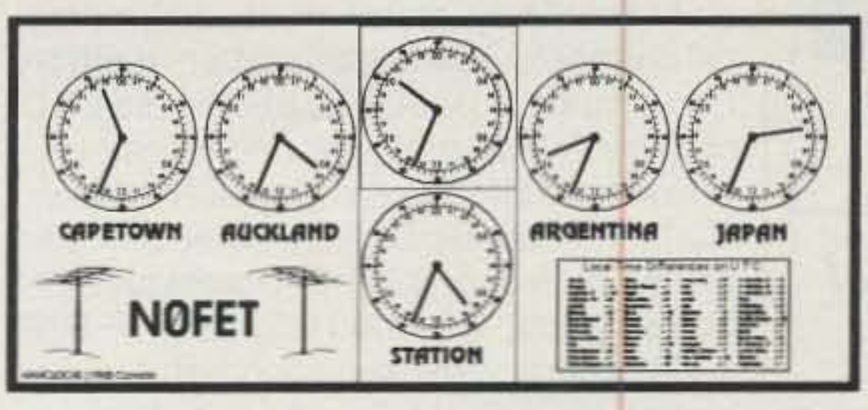
If you are a new, inexperienced ham who knows nothing about antennas, or an old, experienced ham who knows everything about antennas, try an end-fed random-wire antenna. It just may surprise you.

Footnotes

1. You don't have to build *all* the coils shown in fig. 3. Build one at a time and see what it will do. Any one of the coils may cover more than one band, depending on the capacitors you have. Experiment! That's what ham radio is all about!

2. The coils shown in figs. 2 and 3 will handle the output of most QRP rigs. For higher power rigs, you may want to use a heavier duty tapped coil and selector switch.

3. *HAMCALC* is *free* software containing more than 200 programs of interest to amateur radio operators. It is written in GWBASIC in order to cram as many programs as possible onto a 3 1/2 inch 1.44 Mb floppy disc. It will run in either MS-DOS or Windows computers, as long as the computer has a GWBASIC.EXE file installed in its root directory. For a free *HAMCALC* diskette, send US $5.00 (US $6.00 if you also want a GWBASIC.EXE diskette) to the author at the address shown at the beginning of this article.



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Kenwood TH-D7A Data Communicator

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Features include: built-in 1200/9600 bps TNC (one packet, one frame, 256 bytes) compliant with AX.25 protocol; built-in GPS modes with external GPS unit; mic-encoder; DX Cluster spotting; dual receive on same band (VHF only) for both voice and data (two frequencies simultaneously); large dot-matrix LCD, multi-scroll key, menu mode; 200 memory channels with 8-character memory name input; built-in CTCSS; 16-digit, 10-channel DTMF memory; and more.

For more information, contact Kenwood Communications Corp., Amateur Radio Products Group, 2201 E. Dominguez St., Long Beach, CA 90801-5745 (310-639-5300; <http://www.kenwood.net>).

Premier Communications Pryme SPM-600 Speaker Microphone

The new Pryme SPM-600 series speaker microphone by Premier Communications is a lightweight unit that features a quality condenser-style microphone element and high-fidelity audio circuit plus a large-size speaker, maker says. The microphones are enclosed in impact-resistant plastic housings and have coiled microphone cords. The microphones may be secured to lapel, shoulder, or belt with an adjustable clip on the back of the microphone that rotates 360°. The following models are available: SPM-600 for ADI, ICOM, Standard, and Yaesu; SPM-601 for Kenwood; and SPM-602 for Yaesu VX-1R/FT-50R. Other models are available for certain land-mobile radios such as the Motorola GP-300 and Uniden.

For details, contact Premier Communications Corp., 480 Apollo St. #E, Brea, CA 92821 (714-257-0300; fax 714-257-0600; on the web: <http://www.adi-radio>; e-mail: <premier@adi-radio.com>), or circle number 101 on the reader service card.

G4ZPY Keys and Paddles Available from Morse Express

Morse Express has announced that it is now distributing G4ZPY keys and paddles made in England by Gordon Crowhurst, G4ZPY. The G4ZPY line comprises a wide range of straight keys and paddles, some 55 different models in different finishes and styles, The straight keys range from simple brass keys on stone bases to the Sovereign presentation key with engraved plaque, British Gold Half Sovereign inlaid in the top of the knob, and a glass cabinet with gold-plated edging. Paddles range from the miniature three-in-one ($2\frac{1}{2}$" × $1\frac{1}{4}$") to the Very High Speed paddle (rated at 60 wpm) available in solid gold with jewels.

Say You Saw It In CQ

Morse Express will carry the more popular keys and paddles, including the "kit key," as stock items. The remainder of the line will be available by special order. For more information or a catalog, contact Morse Express, 3140 S. Peoria St. Unit K-156, Aurora, CO 80014-3155 (303-752-3382; e-mail: <info@MorseX.com>), or circle 102 on the reader service card.

MFJ *JimHandy*™ Interface

MFJ's *JimHandy*™ CW interface let's you use a 2 meter or 440 MHz handheld to practice Morse code on the air. Plug the unit into a 2 meter or 440 MHz handheld transceiver and plug in a straight key. CW is converted into audio tones that are sent back to the mic jack and transmitted by the HT. The Transmit/Receive switch automatically keys the Push-To-Talk on the HT as soon as you start sending CW. It keeps keyed until you've finished sending and then returns the HT to receive so you can copy. An adjustable T/R delay knob let's you send fast or slow CW.

The MFJ-552 uses a 9 volt battery and measures 4"W × 1 1/4"H × 3 3/4"D and includes an open-end patch cable that can be soldered to your HT connector. MFJ sells optional prewired interface to HT cables for $14.95. They also sell an optional straight telegraph key, the MFJ-550, for $7.95. The MFJ *JimHandy*™ is priced at $59.95. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762 (phone 601-323-5869; fax 601-323-6551; e-mail: <mfj @mfjenterprises.com>; on web: <http:// www.mfjenterprises.com>), or circle 106 on the reader service card.

AOR AR7000B DSP Wide-Range Receiver

AOR USA has released the AR7000B, a wide-range, all-mode receiver which features color video display, DSP, a triple-conversion front end, computer interface and 1500 channels. The LCD color video display panel is 2" high and 2 1/2" wide and displays frequencies, modes, volume, squelch, AGC, bandwidth, channel and bank designators, alphanumeric channel

label, date, time, and more. Video information can be exported to an outboard monitor from the composite video output on the rear panel of the AR7000B. The user can select either NTSC or PAL video formats for the output port. The rear panel also has a nine-pin RS-232C port for full-control computer interface, an 8-pin DIN auxiliary connector, BNC antenna connector, constant-level audio output, external speaker jack, and 12 volt DC input coaxial connector. The front panel has a headphone jack and remote-control receiver window for commands from the standard infrared remote controller that allows operation of the unit from across the room.

For more information, contact AOR USA, Inc., 20655 S. Western Ave., Suite 112, Torrance, CA 90501 (phone 310-787-8615; fax 310-787-8619), or circle number 103 on the reader service card.

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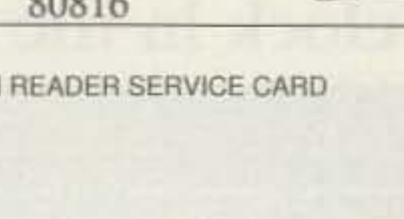

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New Jensen Tools Catalog

Jensen Tools has released their new, expanded 308-page full-color catalog which features Jensen's line of JTK tool kits, handheld JTM multimeters, and hand tools. Over 5000 total products from major manufacturers include test equipment, computer and LAN, wire and cable, telecom, power tools, soldering, storage and handling, work stations, lighting and optical, shop supplies, and communications products.

The company offers same day shipping (free on orders over $100), lifetime guarantee on Jensen-brand hand tools, in-house calibration certification, free tech support, and complete on-line catalog at <www.jensentools.com>. For a copy of their catalog, contact Jensen Tools, 7815 S. 46th St., Phoenix, AZ 85044 (phone 800-426-1194; fax 800-366-9662; e-mail: <jensen@stanleyworks.com>), or circle number 104 on the reader service card.

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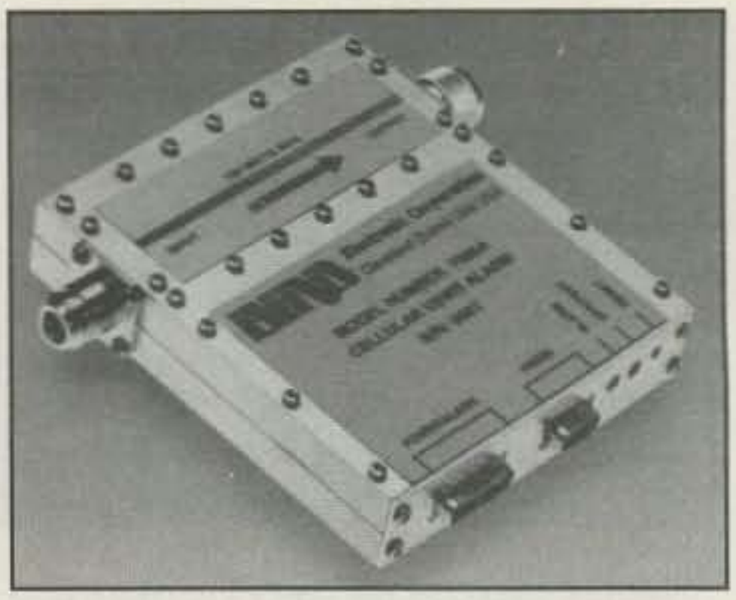
The Bird 7005A VSWR monitor/alarm for 824–960 and 1800–2100 MHz is designed for long-term VSWR monitoring and power measurement in analog or digital cellular, PCS, paging, and two-way radio systems, with automatic shutdown capability where abnormal loads are detected. The 7005A series can be used at any point in the transmission system, including the main antenna feed line, after the combiner. Included are a high-directivity coupler and micro-processor. Instantaneous VSWR values and trends are calculated from forward and reflected power measurements, and compared to an internal VSWR threshold of 1.3:1 and 1.8:1, settable in increments of 0.1 VSWR. A built-in RS-232 compatible ionterface enables the 7005A Series to be connected to a host computer for remote



readout of forward and reflected power, and control of alarm functions.

Power requirements are +16 to +28 VDC @ 0.1 amp or less. For more information, contact Bird Electronic Corp., 30303 Aurora Rd., Cleveland, OH 44139-2794 (440-248-1200; fax 440-248-5426; or e-mail: <sales@bird-electronic.com>; web: <http://www.bird-electronic. com>), or circle 107 on the reader service card.

Svetlana Audio Catalog

Svetlana Electron Devices has introduced their new Audio Tube Catalog. The catalog features detailed specs and performance curves for each of Svetlana's wide range of audio tubes. For a catalog contact Svetlana Electron Devices, 8200 S. Memorial Pkwy., Huntsville, AL 35802 (256-882-1344; fax 256-880-8077), or circircle 108 on the reader service card.

Antique Electronic Supply 1999 Catalog

Antique Electronic Supply's 199 catalog is 72 pages and features many new products, including books (one of which is the *Radio Designer's Handbook*), a line of Hammond classic 300 series power transformers, ferrite rods, inductor coils, telegraph keys (straight key, iambic paddle, dual straight key, and iambic paddle), and more. The company offers a line of products for tube gear—vacuum tubes, transformers, capacitors, parts, and literature.

For a copy of the 1999 catalog, contact Antique Electronic Supply, 6221 South maple Ave., Tempe, AZ 85283 (phone 602-820-5411; fax 602-820-4643; e-mail: <info@tubesandmore.com>; on the web: <www.tubesandmore.com>), or circle number 105 on the reader service card.

BY KARL T. THURBER, JR., W8FX

THE DIGITAL DIPOLE

FROM SOFTWARE THROUGH ANTENNAS FOR THE SHACK

Happy New Year '99

A Happy New Year to all our *CQ* readers! We hope that the just-beginning 1999 will be a most happy and prosperous New Year for all! That being said, in this holiday month we'll continue with our "Digital Dipole" column happenings. We'll kick off the festivities with a peek into our antenna notebook.

Antenna Notes

BA-1 Balun Box from LDG Electronics. In July 1997 we highlighted the LDG Electronics AT-11 Automatic Antenna Tuner kit. As we indicated, Dwayne Kincaid, WD8OYG, offers a fully automatic HF antenna tuner designed to operate better and faster than the internal automatic tuners found in many transceivers. In the same article, we noted the similar but flea-power tuner, the QRP Automatic Antenna Tuner kit. Modeled after the AT-11, it also is a microprocessor-controlled unit, but for QRP: Its power range is 0.1 to 10 watts over the same frequency range.

Now Dwayne has introduced a another related product, the BA-1 Balun Box kit (see photos). The BA-1 is a 4:1 device to allow the easy interfacing of various ladderline-fed antennas and longwires to LDG tuners. The 6 ounce unit covers 1.8 to 30 MHz, handles 200 watts, and is easy to weatherproof. It's available in kit form only and can be built in less than a half hour.

For more info, contact LDG Electronics, 1445 Parran Rd., St. Leonard, MD 20685-2903; (phone 410-586-2177; e-mail: <ldg@ldgelectronics.com>; web: <http://www.ldgelectronics.com>).

Incidentally, Dwayne's excellent website has received a big upgrade since we last reported on it, and it even has each product's user manual posted to the site.

Nye Viking MB-V-A 3 kW Antenna Tuner. One of the better heavy-duty classic antenna tuners is the Nye Viking MB-V-A Viking 3KW Antenna Tuner. Before we note its features, there's some history here that we should mention. The Nye Viking unit is a successor to the classic Johnson Viking Kilowatt Match Box.

If you flip open almost any *CQ* or *QST* from the 1950s or early 1960s, you'll likely find a big E. F. Johnson equipment ad. Between 1949 and 1966 Johnson produced, in kit or wired-and-tested form, more than 53,000 ham rigs, mostly transmitters. First off the Waseca, Minnesota production line were the Viking I and II. Later came the Viking Ranger, Valiant, Adventurer, Navigator, Pacemaker, Courier, Thunderbolt, and many other memorable models.

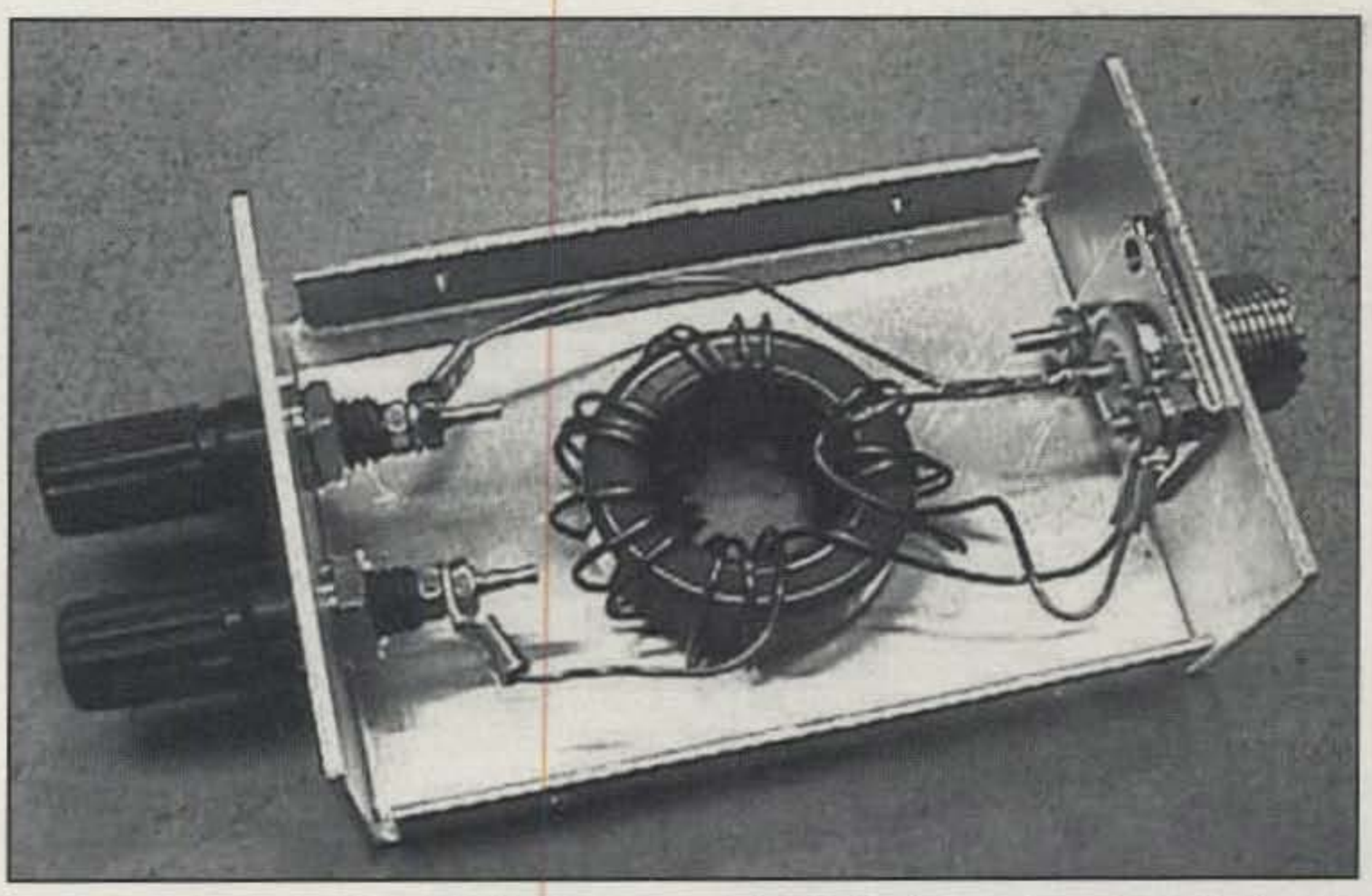
By the early 1960s the solid-state, SSB era was dawning in the amateur market, and Johnson didn't get aboard fast enough. Transceivers (rather than just transmitters) from Collins, Drake, Swan, and other American manufacturers were making inroads. In addition, high-quality Japanese imports were on the way. E. F. Johnson reacted to these trends by abandoning the amateur market and concentrating on Citizens Band and other communications markets.

E. F. Johnson no longer is an amateur radio supplier; the respected Viking name was taken over in the 1970s by the William M. Nye Company, and several Johnson items (but not the kits) were continued by Nye. These included high-power antenna tuners, lowpass filters, keys and keyers, and other accessories.

Nevertheless, many Johnson rigs are still around today in hamshacks worldwide, as are Johnson's best known accessories, the Viking Match Box and Viking Kilowatt Match Box antenna tuners.

The BA-1 Balun Box is a 4:1 device designed to allow the easy interfacing of ladderline-fed antennas and longwires to the LDG line of antenna tuners. The 6 ounce unit covers 1.8 to 30 MHz and handles 200 watts. The unit also is easy to weatherproof. (Photo courtesy LDG Electronics)

The Nye Viking 3 KW Antenna Tuner follow-on to its illustrious ancestor features lowpass Pi-network tuning from 1.8–30 MHz, making use of a heavy-duty, silver-plated, continuously variable inductor



The LDG Electronics BA-1 Balun Box is available in kit form only and can be built in less than a half hour. The unit's small size and easy-to-build construction make it a welcome ham shack accessory. (Photo courtesy LDG Electronics)

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SOFTWARE

DSP Blaster 2.0 uses your PC and sound card to provide tunable highpass, lowpass, and bandpass filters, autotracking CW peaking filter, automatic notch filter, coherent phase-locked CW processor with stereo output, adaptive noise reduction, and AGC. *DSP Blaster* graphs the audio waveform, envelope, spectrum, and CW phase. It can run in the background. $125. *RITTY 2.0* is a high-performance DSP modem for RTTY and PACTOR. The limiterless front-end, sharp BPF, autotuned optimal filters, ATC, numerical flywheel, packet repair, and memory-ARQ recover signals other modems can't. *RITTY* features an FFT spectral tuning indicator, waveform displays, adjustable frequencies, precision AFSK, and FSK & PTT outputs. $150. 486DX, VGA, and 16-bit Creative Labs sound card required (no "compatibles").

AO 6.5 automatically optimizes antenna designs for best gain, pattern, impedance, SWR, and resonance. *AO* features 3-D pattern and geometry displays, 2-D polar and rectangular plots with overlays, automatic wire segmentation, automatic frequency sweep, skin-effect modeling, symbolic dimensions and expressions, current sources, and polarization and near-field analysis. *NEC/Wires 2.0* models true earth losses, surface waves, and huge arrays with the Numerical Electromagnetics Code. Best for elevated radials, Beverages, wire beams, giant quads, delta loops, and LPDAs. *TA 1.0* plots elevation patterns for HF antennas over irregular terrain. *TA* accounts for hills, valleys, slopes, focusing, shadowing, reflection, diffraction, and ground constants. Use *TA* to optimize antenna height and siting for your particular QTH. *YO 6.5* automatically optimizes monoband Yagi designs for maximum forward gain, best pattern, minimum SWR, and impedance. *YO* models stacked Yagis, dual driven elements, tapered elements, mounting brackets, matching networks, skin effect, ground reflection, and construction tolerances. *YO* runs hundreds of times faster than NEC or MININEC. *NEC/Yagis 2.5* provides reference-accuracy modeling of individual Yagis and large arrays. Best for EME arrays. One antenna program, $70; three, $120; five, $200. 386+387 and VGA required.

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with a 25:1 vernier dial. It nominally tunes 40–2000 ohm antennas; balun-equipped models handle balanced loads between 200 and 1000 ohms, or unbalanced loads down to 20 ohms.

Automatic, hands-free separate power and SWR metering is standard. A rugged, five-position pushbutton switch which includes a tuner bypass position is available. The unit weighs 18 lbs.

The Nye Viking 3KW Antenna Tuner is available in several models. The Model MB-V-A ($879) has both antenna switching and the balun. Also available are other models that are less the balun, antenna switch, or metering, and they range in price from $744 to $807. A 5 kW PEP 50 ohm lowpass filter is $56.

Contact the Wm. M. Nye Co., Inc., P.O. Box 1877, 1427 Shannon Lane, Priest River, ID 83856 (208-448-1762).

Update: Olde Antenna Lab Catalog. In the February 1992 and January 1997 columns we profiled the antenna design and manufacturing activities of David A. Clingerman, W6OAL. Dave operates the Olde Antenna Lab (OAL) of Denver. Dave produces a number of rather unique VHF, UHF, and microwave antennas; many of these are quite unusual and innovative. Current offerings include several omnidirectional "wheel" series antennas; 6-, 10-, and 15-element Helixes for 33 cm and up; corner and flatplate reflectors for 33 cm and up; omnidirectional, horizontally polarized "folded halos" for 144–148 MHz and 222–224 MHz; the OAL Mobile Six, a horizontally polarized, 6 meter mobile and fixed station halo; and corner and flatplate reflectors for 33 cm and up. Also offered are a variety of components and accessories. These include power splitters, parabolic dish feeds, bandpass filters, Z-verters (used to adapt 75 ohm hardline for 50 ohm use), and several other products.

For an interesting catalog, contact The Olde Antenna Lab of Denver, 41541 Dublin Drive, Parker, CO 80134 (303-841-1735; e-mail: <w6oal@aol.com>).

Update: Butternut Antennas. In several columns, most recently last April, we highlighted Butternut Antennas products. We also pointed out that the Butternut antenna product line had been acquired several years ago by Bencher, Inc. As a result of the deal, both product lines now are available from a single source or through dealers. The antennas have been consolidated in the Butternut Antennas product line, while the parent Bencher line focuses on keyer paddles, hand keys, a lowpass filter (the YA-1), and the ZA-1A 1:1 balun.

The Butternut Antennas line features the HF9V nine-band vertical antenna for 80 through 6 meters, HF2V dual-band vertical for 80 and 40 meters, HF6V six-band HF vertical for 80 through 10 meters, Model 10/11 Butterfly beam for 10 or 11 meters, and HF5B five-band Butterfly beam for 20 through 10 meters. Accessories are available, including resonators, top-loading kits, radial and counterpoise kits, and mounting kits.

An attractive color brochure with specs on all Butternut products is available from Bencher. Also included with each information request is a very interesting, four-page "white paper"-style tech note creatively entitled "Dirty Little Secrets from the Antenna Designer's Notebook." The tech note takes a hard-nosed, critical look at some of the excessive performance claims advanced for some competing antennas. Bouncing the claims made against back-to-basics, common-sense antenna theory makes the tech note a very instructive read.

For more information and a catalog, contact Bencher, Inc., 831 N. Central Ave., Wood Dale, IL 60191-1219 (630-238-1183; e-mail: <bencher@bencher.com>; web: <http://www.bencher.com>).

Soft Stuff

MPE Calculator. Okay, so now we're supposed to be RF-environmentally safe: The FCC now requires amateur radio operators to perform a routine RF exposure evaluation of their station. As it turns out, doing this hasn't proved to be quite the onerous task it once was considered to be, in some part because of the development of appropriate calculation procedures and software tools to do so.

MPE (Maximum Permissible Exposure) Calculator is RF safety software advertised in *QST* and on the Internet. It's a Windows-based program for the calculation of RF safety limits based on the antenna and operating characteristics. The software was developed to help in the evaluation of an amateur station configuration using any antenna type or combination of antenna types, at all frequencies and operating modes, and at any power level.

For each operating configuration (antenna, mode, power, and frequency), the software calculates RF safety distances you should maintain to meet FCC safety guidelines, and it produces a printed report in the suggested FCC format. (The software uses the actual FCC formulas for calculating RF exposure. Thus, you can use it to evaluate any transmitter at any frequency licensed by the FCC, not just an amateur transmitter on amateur bands.)

A very useful, separate feature of the software is the Power Density option. With it, you can calculate the RF exposure for each of several stations operating in close proximity to each other (as they might at Field Day or at a repeater site) to determine the total RF exposure from all such stations. This capability is quite important, since the FCC requires that in such situations the total combined RF exposure be

determined to avoid exceeding the maximum permissible RF exposure limits for persons in the RF field at the location. You can print a report showing the results of the power density calculations.

MPE Calculator includes a comprehensive Windows help file that includes help topics both on the FCC guidelines and the software itself. The program is available on a 3.5" or 5.25" diskette for $13.95. For more information, contact Jon E. Crisman, N9BHQ, at JC Software, P.O. Box 972, Bemidji, MN 56619-0972 (e-mail: <crisman@paulbunyan.net>; web: <http://www.paulbunyan.net/users/crisman>. The website also includes a helpful primer on the FCC's RF exposure guidelines.

New SSC Communications Product Catalog. Software Systems Consulting perhaps is best known for its line of GOES satellite, HF weather facsimile (Wefax), slow-scan television (SSTV), and electronic messaging software and hardware. Their latest Communications Product Catalog depicts a variety of software updates as well as some high-tech accessories and complete satellite ground receiving stations.

The new catalog features HF Fax for Windows 8.0, which lets you get weather charts and satellite images even while running other programs. The $179.95 software package is a complete SSB facsimile reception system, and it includes everything you need to get weather charts, satellite images, Morse code, RTTY, NAVTEX, Sitor ship-to-shore, and press wire transmissions.

Another popular product is PC GOES/WEFAX 4.0 ($250) for capturing fax images from the GOES and other satellites; and P-Sea Mail™, a $149.95 product for sending and receiving e-mail and faxes through coastal HF radio stations while afloat.

The catalog also includes VHF/UHF satellite receiving antennas and accessories, a scanning satellite receiver, a quadrifilar helix 137 MHz circularly polarized antenna optimized for polar satellites, a 1 meter GOES parabolic receiving dish, a 1692 MHz linear feedhorn, a 1691 MHz loop Yagi, a 137 MHz low-noise preamp, a 1691 MHz to 137 MHz downconverter, and other specialized accessories.

For a free catalog, contact Software Systems Consulting, 615 S. El Camino Real, San Clemente, CA 92672 (949-498-5784; e-mail: <support@ssccorp.com>; web: <http://www.ssccorp.com>).

From the Bookshelf

Electronics Now Bookstore Online. If you're "into" electronics and are a reader of electronics magazines such as *Electronics Now*, you may be familiar with the monthly "New Literature" feature of that publication. In it, there are several mini-reviews of new electronics books. If you don't read the magazine, you may be interested to know that the reviews now are posted on the Books Now Website in the Electronics Now Bookstore section. You can even order the books online if you wish (free printed catalogs are not available, however).

Contact Books Now, Inc., 6600 W. Charleston Blvd., Las Vegas, NV 89102 (phone 1-800-962-6651; e-mail: <orders@booksnow.com>; web: <http://www.BooksNow.com/electronicsnow.htm>).

New Universal Radio Catalog. Universal Radio has issued a periodic update to its well-illustrated, large-format communications catalog. The new, 100+ page catalog is a very good ordering and reference resource that covers equipment for the amateur radio, shortwave, and scanner buff. An impressive selection of antennas, headphones, books, and accessories also is featured. Some new gear covered in the updated catalog includes the SGC SG-2020 HF transceiver; several Grundig radios; AOR scanner and decoding products; and many antennas, ac-

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Transformer: 32 lb. Heavy Duty Hypersil
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Tube: Svetlana 4CX800A Tetrode (2)
QSK: Standard Feature
Line Voltage Requirement: 200/240V, 50/60Hz
Cabinet Size: 20"w x 19"d x 8"h
Shipping Wt: 100 lbs. UPS three cartons

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T/R Switching: 40 Amp Open Frame Relay
Voltage Requirement: 200/240V, 50/60Hz, 30 Amps
Cabinet Size: 20"w x 19"d x 8"h
Shipping Wt: 110 lbs. UPS three cartons

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The world's largest globe is at the Yarmouth, Maine headquarters of DeLorme, a map publisher whose products we frequently have mentioned. At 42 ft. in diameter, Eartha is a 1:1,000,000 scale model of Earth. In fact, if the Sun were constructed at the same scale, it would be 4,560 ft. in diameter and some 93 miles away—located in the Boston suburbs. Too, if you were to build a model of our Solar System at this same scale, the planets' orbits would stretch across all of North America and extend to South America and Europe! (Photo courtesy DeLorme; photo copyright Nance S. Trueworthy)

Housed in a three-story glass atrium, Eartha took two years to build and represents Earth as it is seen from space. Every continent is detailed, with colors illustrating all levels of vegetation, major roadways, and cities. Ocean depths are also completely represented. Eartha is the largest image of Earth ever created. (Photo courtesy DeLorme)

cessories, and books of interest to all three types of radio hobbyist.

For a copy of the catalog, contact Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068-4113 (1-800-431-3939; e-mail: <dx@universal-radio.com>; web: <http://www.universal-radio.com>.

The catalog is free by fourth class mail, or $1 by first class mail. Outside North America, send five IRCs for postage.

We Get Letters

Once again, we're just about out of space. Before wrapping it up this month, however, we'd like to acknowledge a few of the good folks who have written, faxed, e-mailed, phoned, or otherwise corresponded with us over the past several months. A tip of the top hat goes to correspondents Marco Fleitas Sarmiento, EA8AQV; Jay Terleski, WXØB; Dwayne Kincaid, WD8OYG; Neil Sternstein, K2RCH; Yuri Zaruba, UA9OBA; and all the rest.

Short Bursts

DeLorme's World's Largest Globe. Among the many highly capable CD-ROM products we have reviewed are the excellent mapping and navigation software packages from DeLorme. These include Street Atlas USA™, the first consumer mapping software; AAA Map'n'Go®; Global Explorer®; Phone Search USA®; and several others. The company also publishes the popular Atlas & Gazetteer® series of state recreational atlases.

This month we won't talk software. Instead, we'll point to something entirely different. What we're talking about is some 42 feet in diameter, rotates and revolves just like the real Earth, and was created from one of the largest mapping databases in the world. Its name is Eartha™, and it's the world's largest moving globe—the largest image of Earth ever created (see photos).

Housed in a three-story glass atrium at the company's Maine headquarters, Eartha took two years to build and represents Earth as seen from space. Every continent is well-detailed, with vivid colors illustrating vegetation, major roadways, and cities. Ocean depths are also represented.

As you might expect, Eartha was developed using computer technology, being designed by company founder and CEO David DeLorme and constructed by DeLorme staff members. The mapping data, which took over a year to compile, constitute a special composite database built from satellite imagery, colored bathymetry (ocean depth data), and information from terrestrial sources such as road networks and urban areas.

The printed Eartha database is equivalent to about 140 gigabytes (or 214 CD-ROMs), making it one of the largest databases in the world. Its scale is 1:1,000,000, which works out to be one inch equaling nearly 16 miles; at this scale, California stands some 3 1/2 ft. tall!

Eartha's "skeleton" is the Omni-Span™ Truss structure, a DeLorme-developed system of over 6,000 pieces of aluminum tubing. The "skin" is constructed of over 792 map sections, printed on special materials and mounted on lightweight panels. The panels are affixed to the structure with a unique bolt system.

Eartha tilts at 23.5 degrees, just as Earth does. It revolves on a specially designed cantilever arm and rotates on an axis. This action is driven by two electric-powered motors, which are commanded by a computer. One combined Eartha revolution and rotation occurs every minute at maximum speed.

Eartha exceeds the size of the globe currently listed as the largest, the "Globe of Peace" in Apecchi, Italy, at 33 feet in diameter. For this reason, Eartha is being submitted for inclusion in the *Guinness Book of World Records*. DeLorme also has started the Eartha Educational Alliance, a nonprofit group of volunteers who will use Eartha and other tools to educate children about geography and the world around them.

For additional information, contact DeLorme, Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (1-800-227-1656; e-mail: <info@delorme.com>; web: <http://www.delorme.com>). (The Eartha globe has its own Home Page at <http://www.delorme.com/eartha>.)

Wrap-Up

That's all for this time, gang. Next time, more "Digital Dipole" topics of current interest. See you then.

Overheard: As we enter the New Year, we should remind ourselves that even though it's sometimes uncomfortable, change actually is good for all of us.

73, Karl, W8FX

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CIRCLE 126 ON READER SERVICE CARD

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

A Rugged J-pole for Packet Node Sites

For the record and as some background, the Zepp was one of the early antennas used as a "trailing" antenna behind the Zeppelin (blimp) of the early 1940s. Later the Zepp was fashioned into an antenna for higher frequencies, and in the 1970s and early '80s the name was changed to the "J-pole" to favor its appearance when constructed as a VHF vertical antenna.

In the late 1950s or early '60s I read an article written by Lew McCoy, W1ICP. It was about an antenna called a "Zepp." In his reference the antenna resembled one I had raised called a "Windom." After building Lew's version, I found I liked its performance better.

Thus began a new era for me, experimenting and building Zepp (J-pole) antennas. I've since built J-pole antennas that operate on amateur bands from 14 MHz all the way to 912 MHz. I've built J-poles out of everything from 300 ohm TV twin-lead, to 450 ohm ladder line, copper rigid water-pipe, and even electrical metallic thin-wall conduit.

As I add new nodes to mountaintops here in Virginia, I often come up with another idea for a future column here in *CQ*. Finding material for a future column is always easy. There is so much to write about, it's as if there is a never ending supply of fodder just over the next ridge.

This time I think I have come across something that will be of interest not only to the packet radio system node operators, but to the voice repeater operators as well. This is especially true where the packet node or voice repeater is situated on a mountaintop that is a hostile-weather location during the winter months.

Adding a new packet radio node or voice repeater is only half the battle. When I talk about "hostile environments," I am referring to the torture that our node or repeater antenna is subjected to during the heavy ice loads, snows, winds, and rain. When we are warm and comfortable in our homes, the node or repeater site high on that mountaintop may be receiving gale-force winds, and the antenna may slowly be loading up with a new layer of radial ice.

My friend Chuck and I were atop one of these mountaintops recently. The wind was coming at us like a cold—no, a frozen—knife. The gusts were topping over 50 mph. Now to some this is not too heavy a wind. However, when the wind continues at this clip hour after hour, the site usually begins to show signs of wear and tear early on.

The part of our site that takes the worse beating is the antenna. I've tried almost every kind, shape, and model at these sites. At 3000 and 4000 feet we begin to see damage to the antenna soon enough.

I began to think: If this is bad here on this little 3000 foot knob, then Fred,

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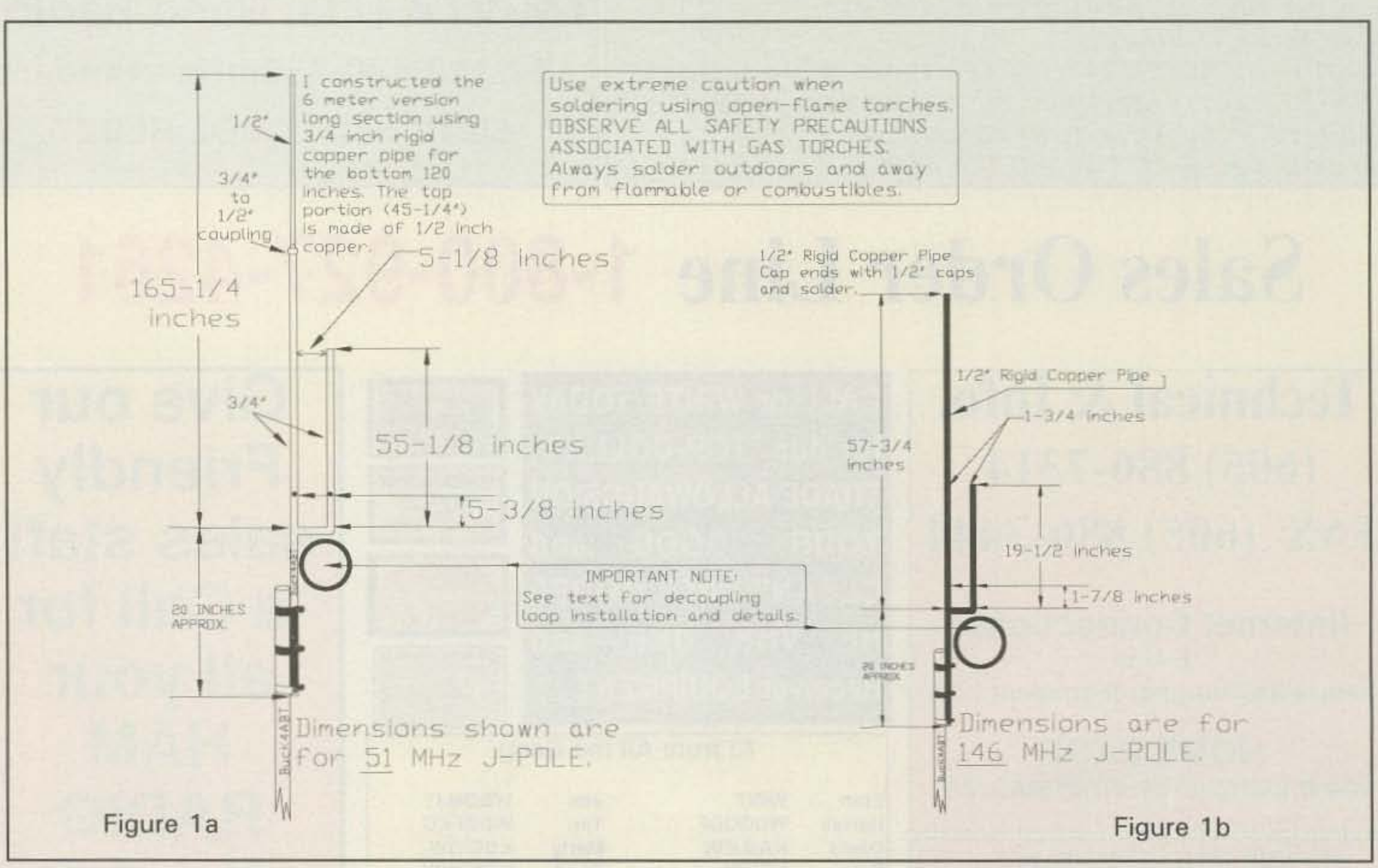

Figs. 1(A) and (B)– Rigid copper water pipe is not as heavy as some might think, especially when the J-pole is only 58 inches long at 2 meters (1A), and about 166 inches long at 6 meters (1B). (See text.)

Say You Saw It In CQ

WB4QOC, really has a problem with his node antennas atop Grandfather Mountain (nodes WB4QOC-5 and WB4QOC-6) and Mount Mitchell (nodes WB4QOC-2 and WB4QOC-3), both in North Carolina. Grandfather Mountain is over 5400 feet tall, and Mount Mitchell is the highest point in the United States east of the Mississippi River at 6684 feet.

We do know that winds in excess of 190 mph have been recorded atop Grandfather Mountain, but we understand that the equipment used to measure the wind velocity at Mount Mitchell was blown away—pegged out and burned out the bearings in the anemometer.

The first winter that node 6684 was active, Fred replaced the ISO something or another with a stainless-steel whip. It lasted the rest of the season, until it was found in the parking lot of a nearby lodge. It was shot! Our next try was with a very stubby, quarter inch diameter Wintenna dipole. That one lasted through the next winter. It must have been a good one, as someone had climbed up there and taken it. We know it was not blown away; wind doesn't use cable cutters to remove antennas. I think Fred went with an insulated chunk of water pipe. That was until now.

Something to Think About

All the SNOs who support the packet nodes at high locations know or have experienced what I'm talking about. While I was atop one of my packet node sites, an idea hit me. As Steve, N4JTH, says, I had a brain, uh . . . "wind-breaker."

Most of the antennas I have been installing at the new node sites are the copper version of the J-pole. I've removed most of the fiberglass antennas and *all* the aluminum composition types and models. I've learned that aluminum was not intended for use at high elevations, especially where ice and wind wreak havoc on them all winter.

I then tried the next level of durability in the metallic family—copper. Rigid copper water pipe is not as heavy as some might think, especially when it is a J-pole that is only 58 inches long at 2 meters and about 166 inches long when used at 6 meters. To make the 6 meter version a bit lighter and still maintain the durability, I make the bottom 120 inches of 3/4 inch rigid copper, and the final (top section, 45 1/2 inches) I make of 1/2 inch rigid copper pipe (see fig. 1[A]). We'll discuss this idea further a bit later. For the record, I find that EMT (electrical metal thin-wall conduit) makes a great J-pole, and I find the same characteristics with 1/2 inch EMT as I find with 1/2 inch copper.

Let's Talk About The J-pole

For the most part, the J-pole has been a

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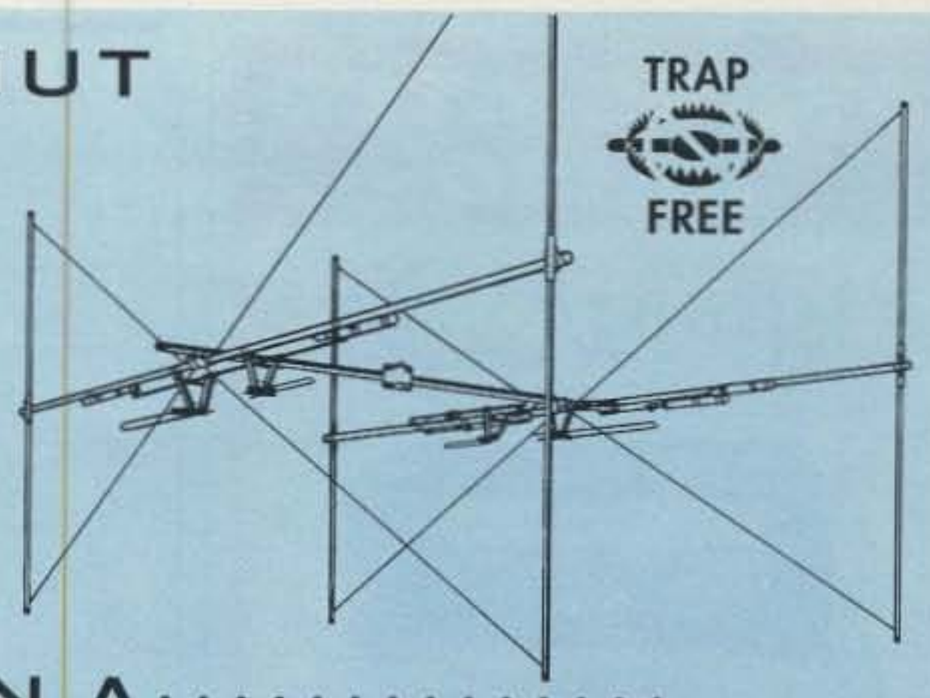

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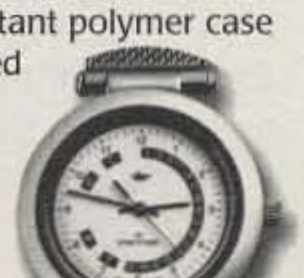

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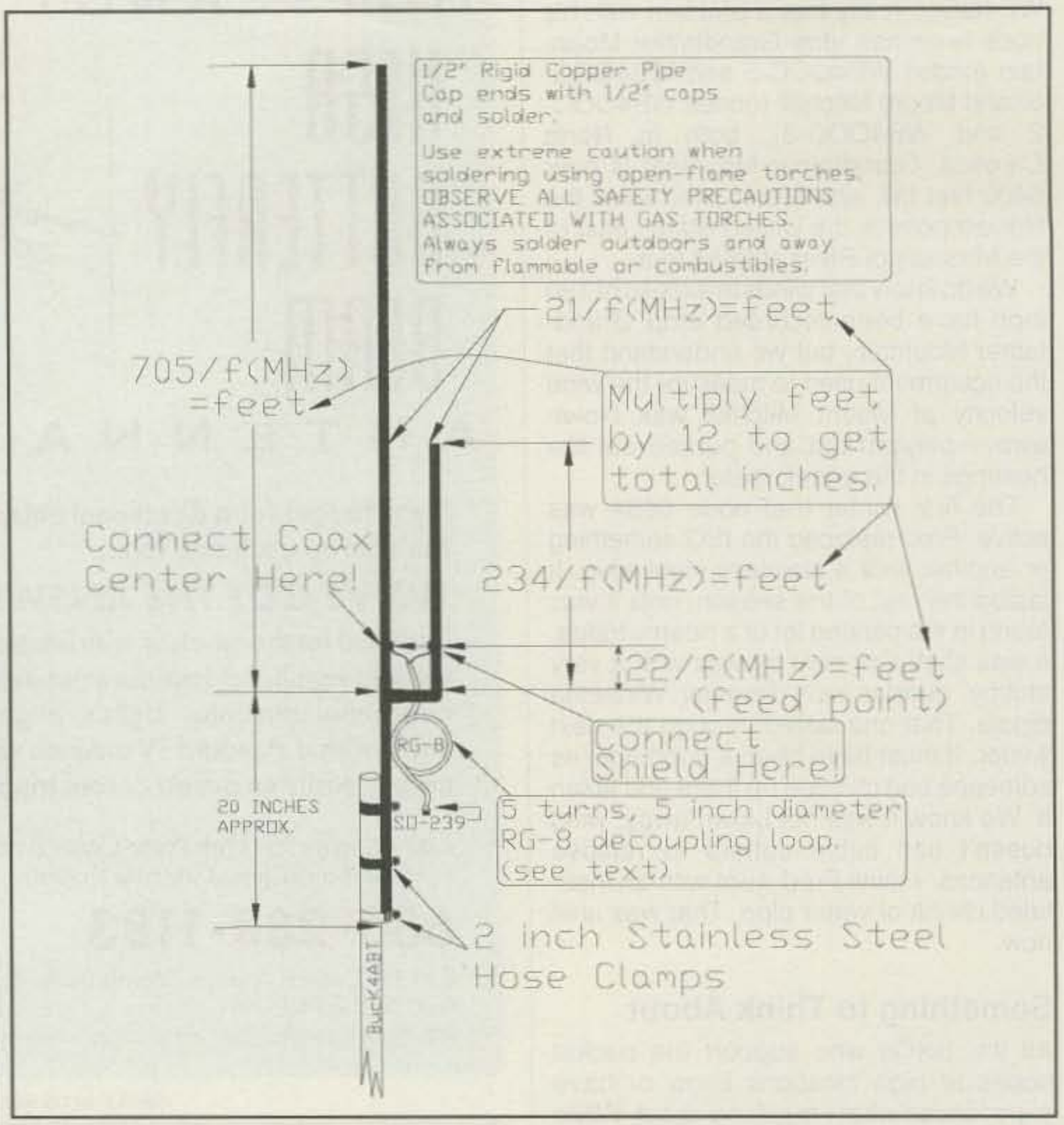

Fig. 2– Notice how the decoupling loop is formed from a length of the coax coiled into a 5-turn, 5 inch diameter loop. The coil is then attached to the mast as shown. For the final touch, attach an SO-239 (female) coax connector. (See text.)

2 meter and 70 cm antenna. As a matter of fact, the first ones were designed and constructed using 300 ohm, television twin lead (or 450 ohm ladderline; see Lew McCoy, W1ICP's J-pole article, July 1994 *CQ*). Not many configurations were supportive of building J-poles for frequencies below 144 MHz or for environments that were demanding of a more rugged type antenna.

A few years ago, I replaced a 6 meter dipole at one of my packet node sites (3000 feet) with a 6 meter J-pole (see fig. 1[A]). The first thing I noticed was that instead of just hitting the local 9k6 backbone nodes (those within 50 miles), I was suddenly reaching nodes a hundred miles away atop Herndon Mountain in West Virginia. That's a bit farther than 100 miles! The path is there 95% of the time with the J-pole. The path was there 0% of the time with the old 6 meter dipole.

To help support this data and the use of the more "durable" J-pole, and at frequencies below 145 MHz, I received some welcome help at gathering data from Al Feldman, K4ZMC. Al is a long-time friend who has been around packet radio as long as packet radio has been around. Al installed a 6 meter (copper) J-pole at his "very hostile environment site" above 4000 feet. Node site K4ZMC-7=MARS (no, not on planet Mars) is near Mars Hill, North Carolina. Actually, the first antenna went to the 9600 baud backbone node on 6 meters, K4ZMC-9, alias 9600.

When Al installed the J-pole at node 9600, I had the support I needed to begin compiling data on the performance of the J-pole at 6 meters, and with Al's location being what it is, it gave support for the durability of the ruggedized version.

Since then, I've begun using 3/4 inch EMT to construct my 6 meter J-poles. Although a bit heavier than the copper version, EMT is stronger and sustains even stronger winds. I used the EMT version at K4ABT-4=9603 atop Poor Mountain southwest of Roanoke, Virginia. The reason I did so here is because I had lost several aluminum antennas at this location, and I felt that I needed to make this antenna a very "beefy" version to handle the high winds and heavy ice loads at this site.

The reason I've not said a whole lot about the EMT version is because the rigid

Say You Saw It In CQ

copper water-pipe version can be built (joints soldered, sweated together) using a single canister Benz-O-Matic™ propane torch. This is not the case with the EMT version. It must be built using brass-compound brazing rods. Thus, it requires a hotter melting flame than a propane torch can produce. To get the correct amount of heat to braze the EMT together, I must use a combination torch/flame that uses oxygen and acetylene gas or a less expensive Benz-O-Matic™ oxygen and MAPP gas. The latter is available at most Lowe's Building materials for less than $40 ($39.95). The kit comes with enough welding rods to build one antenna. It also comes with two disposable tanks—one of oxygen and one MAPP. The catch is one canister of oxygen is not enough to finish the job (one 6 meter J-pole). If you ever consider such a project, make sure that you have at least two canisters of oxygen ($7.95 each). In any case, make sure you are out of doors and away from combustible materials while using this type of welding system. **Use extreme caution when working with open-flame torches of any kind.**

Some Notes About J-poles

There are very good reasons why the J-pole antenna has become so popular in the past few years. They are economical and easy to build. Now that we have the support data, we are finding they are also rugged enough for the more hostile environments that we have at our node and repeater sites, even below 145 MHz, on our 9600 baud backbone at 51 MHz.

The 6 meter J-poles that I've installed on my nodes are exhibiting over 4 dB increase in signal strength above the dipoles that were in use on my 9600 baud (6 meter) nodes.

The most recent antenna I replaced with a J-pole was a 2 meter (see fig. 1[B]) aluminum, base station, commercially built amateur antenna purported to have more than 3 dB gain over a dipole. The J-pole I replaced at node K4ABT-7, alias 007, has increased the average signal at 15 miles by more than 5 dB. Enough said!

Our J-pole does not have radials! So what? Well, this is what. Without radials, there are antenna (RF) currents that flow along the outer surface of the coax cable shield that introduce VSWR along its length. This kind of RF action tends to corrupt performance of an antenna that has no radials. Two things can happen: RF may be absorbed and hot-spots along the coax shield will raise the VSWR to an unusable level. To prevent this from happening, we add a form of decoupling loop just below the feedpoint of the J-pole (see fig. 2).

Our decoupling loop is sometimes mistaken for a matching balun. This is okay, as it does perform some of the properties of a balun while altering the flow of RF back onto the coax cable shield. In short, this decoupling loop performs by canceling these effects and creating a balanced to unbalanced matching transformer. Oh, didn't I say that before? The J-pole is a "balanced" fed antenna. The 50 ohm coax that we use to feed it with is "unbalanced." Thus, we have another reason for adding the decoupling loop. OK, Lew, it's a balun.

To make our decoupling loop for the 6 meter J-pole let's use a length of the same type coax that we use as the feedline. Make a 5-turn coil (4 turns for 2 meters) 5 inches in diameter and tape it to the J-pole mast below the feedpoint(s). We do this near the point where it connects to the antenna (see fig. 2). In either case, this 5-turn, 5 inch diameter coil serves to isolate the feedline's outer conductor from reflected energy (RF) of the antenna radiating element(s).

To put some of you at ease with the feedpoint question, I did run some tests on the two ways to feed the antenna—e.g., whether it made a difference if the

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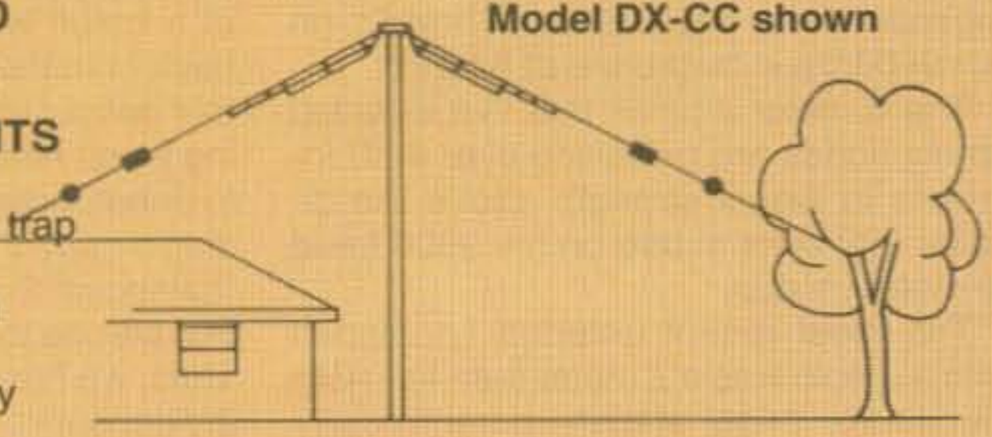

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center conductor was connected to the short tuning stub or longer (radiator) section of the J-pole.

Although there is not a big change in VSWR, let it be known that there is a pronounced (worse) difference in field intensity when the coax center conducted is attached to the short stub of the J-pole. Not good! Without a lot of fanfare, here is a rule: Be sure the coax *center* conductor is attached to the *longer section* of the J-pole and the coax shield is attached to the short section.

An Ounce of Lightning Protection

The shorted matching stub of the J-pole appears as if it is a short circuit across the antenna terminals of the connected radio or transceiver. There is also an ounce of protection from static discharges via the antenna port even if you don't make a practice of disconnecting your antenna before a storm. To make life easier, and should you ever need to exchange or replace the antenna, you may wish to do as I have. I made up a section of RG-8 coax. I then dressed and tinned one end and inserted it/them under the feed-point hose clamps. I then coiled a length of the coax into a 5-turn, 5 inch diameter coil (the decoupling loop). I attached it to the mast as shown in fig. 2. For the final touch, I fitted the (lower) end with an SO-239 (female) coax connector.

To adjust VSWR to frequency (145.770 MHz for 2 meters or 51.12 MHz for 6 meters), slide the feed point (hose clamps) up or down as required. You should be able to set the VSWR very close to 1:1. (It is best to make the VSWR setting using at least 25 feet of coax between the SWR meter and the J-pole connector.)

I have a 10 foot section of 1 1/4 inch pipe standing in my backyard with 3 feet of it in the ground. I attach the antenna to the pipe using 2 inch hose clamps. A long length of (not coiled) coax allows me to move away from the antenna at least a wavelength while making the VSWR tests. In short, **do not stand near the antenna while testing VSWR.**

Having fun while saving lives with packet radio is what we're all about. For more information and illustrations of the J-pole, visit the Packet Radio Networking home pages on the Internet at <http://www.PacketRadio.com/jpole.htm>. You'll find even more packet radio information at <http://www.PacketRadio.com>, <http://www.PacketRadio.org>, or <http://www.sedan.org>. Visit my personal pages at <http://www.qsl.net/k4abt>. E-mail may be sent to me at <k4abt@PacketRadio.com>.

73, BucK4ABT

MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

More Amplifiers and a Brief Primer on dBm

I cannot believe that another year is upon us, and what a year—the last of the 20th century (or is it the next to the last with the century formally beginning in 2001?). At any rate, I wish you the very best, and as I have said at this time for the past 25-plus years on the pages, "May this be the year that all of your dreams and wishes come true."

Last month we spoke about audio amplifiers and a possible replacement for the LM386. This month we would like to make you aware of an RF amplifier from Motorola that can be used as a low-power device at frequencies of up to 2.5 GHz. The device is the MRFIC0915, and while it will not fill all RF needs, it can easily be used as a general-purpose RF block to implement VCOs, buffers, front-end noise amplifiers, and the like. The device comes in a very tiny SOT-143 surface-mount package and contains all necessary bias components within the chip, allowing a minimum of external components.

The MRFIC09 provides 18 to 20 dB of gain at 850 MHz with only 2.7 volts of Vcc and draws 5.6 ma. Output power can be as high as 2.3 dBm (roughly 1.5 milliwatts) and isolation from input to output is 44 dB. Fig. 1 is a schematic of a typical 850 MHz amplifier to show how simple it is to use the device. The circuit is similar to that of the popular MAR-type amplifiers from Mini-Circuits and should be quite easy to get going. For use at other frequencies, you need only scale the tuned circuit appropriately. Cost is only $0.75 in production quantities. For further information, contact Motorola Semiconductor at 602-413-4991, or check them out on the net at <www.motorola.com/wireless-semi>.

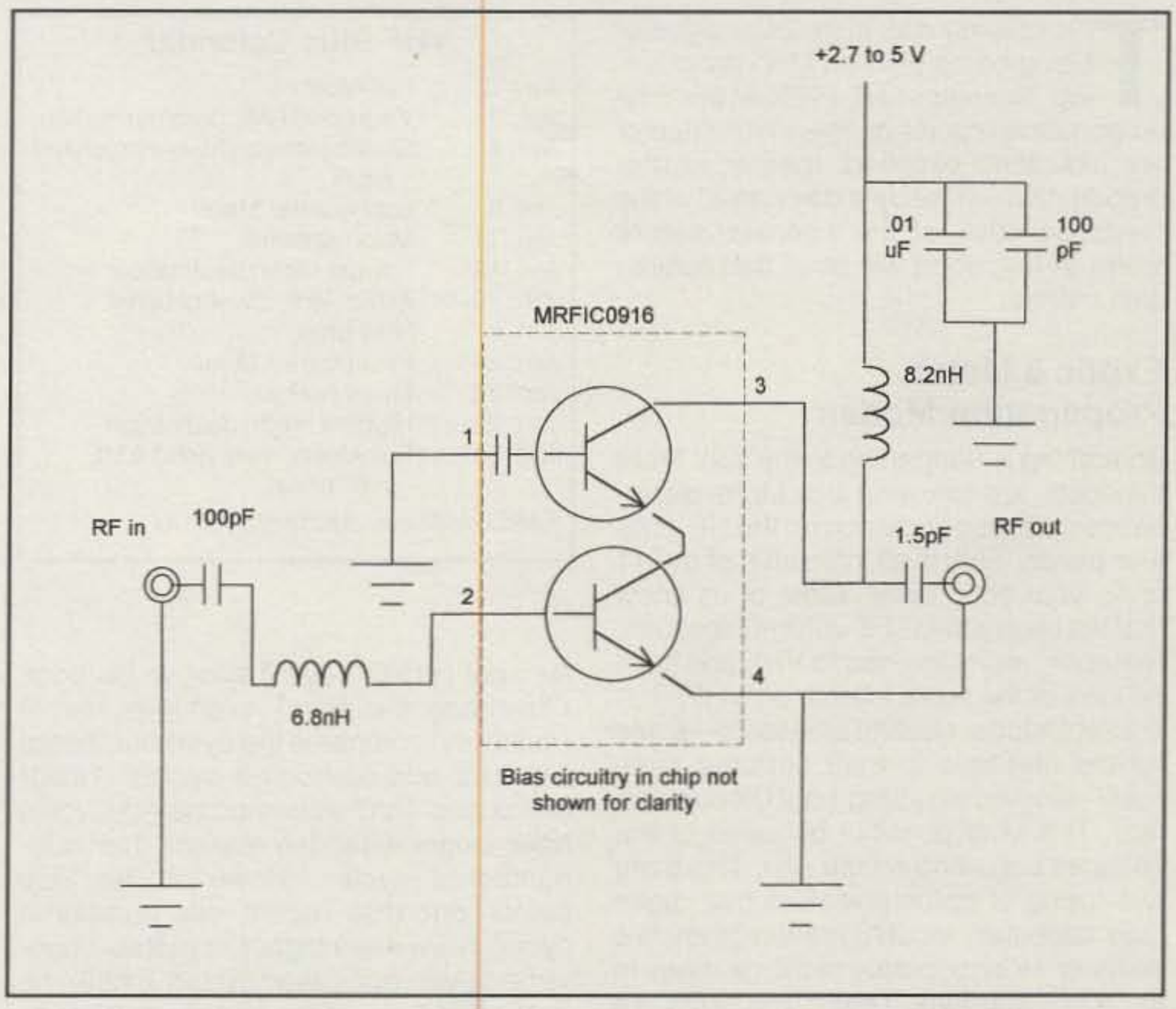

Fig. 1– Typical 850 MHz RF amplifiers using MRFIC0916.

You will note that we mentioned power output for the above chip in terms of dBm. While most of you are familiar with watts, milliwatts, and microwatts, not to mention volts and milliamperes, the term dBm may not be as familiar. In the RF world, however, this parameter is used regularly to describe the performance of an amplifier. The point of reference is 1 milliwatt in an impedance of 50 ohms. This is known as 0 dBm. Other power levels are determined by the logarithmic ratio referred to 1 milliwatt. For those interested, the actual formula is:

$$\text{Power in dBm} = 10 \log_{10} (\text{Power}/1 \text{ mw})$$

For the non-mathematician, this simply means that:

0 dBm = 1 milliwatt
+3 dBm = 2 milliwatts
+10 dBm = 10 milliwatts
+20 dBm = 100 milliwatts, etc.

For levels less than 1 milliwatt:

–3 dBm = 0.5 milliwatts
–10 dBm = 100 microwatts (0.1 milliwatt)
–20 dBm = 10 microwatts, etc.

The beauty of this measurement comes when one wishes to calculate the gain of several cascaded stages. Two 10 dB amplifier stages provide a total gain of 20 dB (10 + 10). If you apply 1 milliwatt or a level of 0 dBm to the input, you get 20 dBm or 100 milliwatts at the output. This saves a lot of calculations involving voltage and impedance, especially when the gain (or loss) of a stage is not a nice, neat whole number. Calculating the voltage or current once, if needed, at the end of the line is then all that is necessary. Now when you look at the specifications for gain blocks such as the Mini-Circuits MAR and ERA lines, you will understand what the amplification level is as well as the maximum power the particular device can handle.

This year I would like to continue to invite all readers to share their homebrewing experiences with us. As regular readers of this column know, I am a strong supporter of experimentation and have always felt that the contributions of amateurs during the 20th century could (and should) continue into the 21st century. Elaborate research facilities are not always required, and contributions to the state-of-the-art can come more from ingenuity than from a room full of elaborate test equipment. If we share accomplishments, it is always possible that what one person comes up with will spark the imagination of someone else. There abounds, in the surplus market, a wide variety of components, the likes of which would have been magic in the 1950s. The cellular telephone industry, ISM bands, GPS equipment, and outgrowths of satellite communications, to mention only a few, have made components suitable for use in the UHF spectrum and the frequencies above 1 GHz suddenly within the technical and financial reach of the average person. Let's get on the bandwagon and show the world that the spirit of 200 meters and down can be extended to 200 nanometers and down!

73, Irwin, WA2NDM

c/o CQ magazine

November Column Correction

I would like to thank those readers who correctly pointed out my blunder in the November installment of "Math's Notes." I cannot blame typographical errors and I cannot say that this was a test to see how alert you all are. I must take the blame myself. Obviously, Power = Voltage × Current or E^2/R or I^2R.

Since I believe this is my first major blunder in 25 years, I promise not to have another for another 25.

BY JOE LYNCH, N6CL

VHF PLUS

ALL ABOUT THE WORLD ABOVE HF

Leonids Shower Early Reports Very Good

This column was in its last stages of being completed on Monday morning, November 16, 1998. At this time propagation reports on the VHF reflector are indicating excellent meteor scatter propagation—already a day ahead of the predicted peak of the *Leonids* meteor storm. A full report will be in this column next month.

Exotic 6 Meter Propagation Modes

Something is happening to the sun. More sunspots are showing up. More disturbances are also occurring on the HF amateur bands. This is all indicative of the 11 or so year solar cycle. Most of us know that the cycle affects HF communications. However, many are new to VHF and have no idea of the sun's effects on VHF.

Last October several amateurs—some for the first time in their amateur radio lives—worked very long-haul DX on 6 meters. This was possible because of the changes occurring on the sun. There are two forms of communication that make their appearances on 6 meters every few years or so in response to the changes in the sun's activities. These two forms are *F2* and TE.

***F2* Propagation.** The *F*-layer is the atmosphere's highest layer. It is found between 100 and 300 miles above the surface of the Earth. During the peak of the sunspot cycle this layer receives ionization that will support refraction of wavelengths into the 6 meter band. Worldwide propagation is possible during the years surrounding the peak of the sunspot cycle.

Six meter enthusiasts plan for these times in order to complete the necessary contacts for achieving DXCC. In fact, the peak of the last cycle (Cycle 22) produced the first recipients of this award and boosted many others within tantalizingly close proximity of their goal. No doubt those operators who didn't quite make it during Cycle 22 will do so during the peak of Cycle 23.

When the solar cycle is at its minimum, little *F*-layer propagation occurs. Many operators actually disassemble their 6 meter stations and store them until the peak of the next sunspot cycle.

What can you expect from the next sunspot cycle? Peter Taylor, in his book *Observing the Sun*,[1] examines recent cycles and compares the even-numbered with the odd-numbered cycles. Taylor concludes that even-numbered cycles have longer extended maxima than odd-numbered cycles. However, he also points out that recent odd-numbered cycles have been higher than their counterpart even-numbered cycles. Finally, he notes that " . . . . if the odd-even relationship continues, the maximum of Cycle 23 should also be a very strong one, perhaps with a peak strength, which approaches 200 (in mean sunspot numbers)."

What About *F2* on Other VHF+ Frequencies? The MUF of *F*-layer propagation rarely reaches 70 MHz. Only on very rare occasions have European amateurs, who have the 70 MHz amateur band, made contact with stations via this form of propagation.

In fact, the 6 meter amateur band was actually an FCC compromise that recognized the rarity of this form of propagation. Before World War II, amateurs in the United States had the use of the 5 meter band, which extended between 56 and 60 MHz. As a way of allocating frequencies for the new television services, the FCC set aside certain blocks of 6 MHz for the lower channels. Originally, the Commission was going to give the amateurs a band between 44 and 48 MHz. However, intense lobbying by the ARRL convinced the FCC that there was sufficient occurrence of both sporadic-*E* and *F2* propagation so the attraction of the band " . . . would possess small novelty and much of the eager interest of amateur observers would disappear."[2] Owing to the League's urging, the FCC created a channel 1 beginning at 44 MHz, and then granted amateurs the 6 meter band between 50 and 54 MHz. The allocations continued with the assignment of channel 2 between 54 and 60 MHz. (Eventually, the FCC abandoned the channel 1 assignment and later subdivided it for use by fixed and mobile services. Such services serve as beacons today, alerting 6 meter operators to possible impending openings on their band.)

While most *F2* propagation disappears during sunspot lulls, some signals are occasionally disseminated by this mode. No one knows why; it just happens! That's the magic of the magic band of 6 meters.

TE Propagation. Transequatorial, or TE, propagation is related to *F2* propagation in that its signal is refracted by the *F* layer. TE also seems to occur most often during the peak of the sunspot cycle. Additionally, TE propagation seems to occur more often in the spring, during the late afternoon or evening.

To take advantage of TE propagation, both you and the station you are trying to work must each be the same distance from the equator. Unfortunately, this rules out all but the southern tips of Florida and Texas and the southern west coast on the continental United States. Nevertheless, it does include stations on the opposite end of South America, southern Africa, and in the Pacific.

Although it has yet to be reported, propagation up to 432 MHz is possible. With sporadic-*E* link-ups, occasional contacts to more northern QTHs on the continent can occur on 6 meters. More rare are meteor-burst links with TE propagation. One such event is believed to be the cause of the contact that Larry Lambert, NØLL, had with Nob, VR6JJ. Larry reported that he could barely hear Nob, until all of a sudden he burst through. They quickly completed the contact, and then Nob was gone. Larry attributes that sudden burst to ionization caused by a meteor burn.

How Does TE Propagation Work? Most of the time the southbound signal travels outward to an *F2* layer north of the equator, is refracted back to earth at the equator, bounces outward to another *F2* layer south of the equator, and is finally refracted back to Earth. However, sometimes these two layers break up into ionized clouds and traverse the equator. When this happens, the signal appears to become trapped below these clouds and

VHF Plus Calendar

Jan. 1	Full Moon
Jan. 3	Very good EME communication.
Jan. 4	*Quads* meteor shower predicted peak
Jan. 9	Last quarter Moon
Jan. 11	Moon apogee
Jan. 16	Lowest Moon declination
Jan. 16-18	ARRL VHF Sweepstakes
Jan. 17	New Moo.
Jan. 24	First quarter Moon
Jan. 28	Moon perigee
Jan. 29	Highest moon declination
Jan. 31	Full Moon. Very good EME conditions.

EME conditions courtesy W5LUU.

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is continuously refracted until it lands on the surface at the distant location. It is this breakup, which seems to be what occurs during an auroral event, that creates the transequatorial opening on 6 meters.

Increased *F2* Propagation Detected. One of the most consistent observers of 6 meter propagation is Pat, WA5IYX. Pat lives in the San Antonio area, which puts him in a zone that is equidistant from areas of higher population in South America. This factor is important for detecting the elusive TE propagation that occurs with increasing frequency with the increase in the solar cycle.

Late in October Pat made some observations which he reported to the VHF reflector and which follow here:

This is being composed before checking out the "regular" propagation reports on the web sites, so information there may confirm or dispute some of this (and thus require a modified analysis).

A goodly part of this weekend was spent "dabbling" in the CQWW HF DX Contest. The conditions on 10 m seemed exceptionally good when one considers that the solar flux is barely over 100. On October 25, 28 MHz had all the morning earmarks of magnetic-storm behavior with short *F2* into Florida before the W1 path was open. The afternoon 50+ MHz conditions were still a bit beyond what one might have expected though!

Around 2055 UTC on 48.85 MHz Spanish was heard. As old timers will know, this was a heavily used spot for Ecuadorian offshore oil rigs. It is also used in Mexico by their petroleum industry. Hearing that and checking Channel 2 had me at first thinking just some *Es* to XE. However, there were no 6 meter XEs or beacons heard.

Soon the strong 50 MHz backscatter from W5s (though possible with sporadic-*E*) was deemed to be *F2* due to the wide azimuth spread that some ops had reported via the 28.885 net.

To reduce the local Channel 2 LPTV (37 watts 6 meters southeast of me, and still "acting up"!) the DX on there was "peaked" to the south. Around 2105 Z it did finally dawn on me that this might be one of those rare *F2* events where the MUF reaches Channel 2. The severe multi-path ghosting and lack of any audio were the classic clues. However, the rapid QSB (not usually seen with *F2*) had me confused. By 2115 UTC most of the Channel 2 DX had faded. Without a spectrum analyzer it's hard to say just how far beyond 55.25 MHz the MUF reached in this event.

Between 2200–2230 UTC there were very strong (direct) 50 MHz single-hop *F2* signals from HC5K in EI59 (with weaker HC1BI and HC2FG in FI07). This, in my view, lends considerable credence to that earlier TV DX having been *F2*.

On all prior Channel A2 *F2* MUF events in Cycles 20–22 one of the major hallmarks was the intense 50 MHz backscatter. Those around for *the* magnetic storm of Cycle 20, March 8, 1970, will vouch for that! During Cycles 21 and 22 several of these high-MUF events occurred. For the most part, I could generate very little interest via 28.885 MHz in having folks take a look (if not local) at Channel 2 during them. (I'd thought that the rarity might be more interesting, for at least a moment, than chasing a bunch of grids, etc., on 6 m backscatter!)

Liberia Back on EME

For the past 20 years the country of Liberia has been racked by civil war. The war had escalated to such tragedy that the basic infrastructure was torn apart. However, a little less than two years ago the civil war finally came to an end when elections were held. Charles Taylor's National Democratic Party reportedly won 75 percent of the vote. As a result of the landslide election, Taylor was subsequently inaugurated president.

While peace has come to this country, amateur radio has been very slow to return to the scene. As of last fall only one station, the Don Bosco Radio Club, EL2RL, which operates mostly on CW with 1–2 watts and dipole antenna, is presently on the air regularly.

Last fall, however, Eric, EA5GIY, a Spanish amateur radio operator and active EMEer, assisted two Liberian amateurs in operating EME using a marginal

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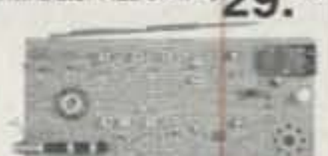

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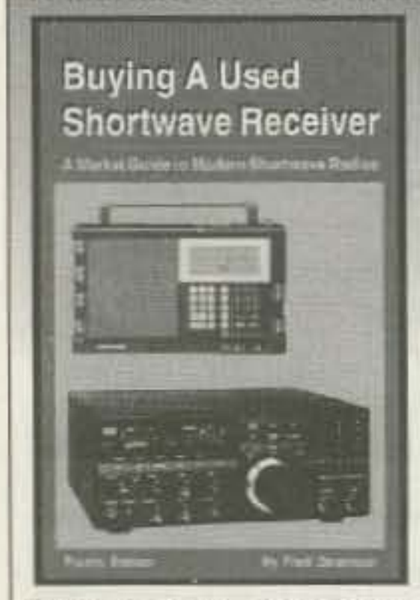

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CIRCLE 50 ON READER SERVICE CARD

station, consisting of the following. The antennas were four 11-element Tonnas, spaced 3 meters apart and fed with RG213. The splitter was a Tonna four-way power splitter. The equipment included a Ten-Tec 144-28 transverter, and 100 watt power amp connected at the feed point. The rig was a Yaesu FT-80C channelized transceiver, without either a CW filter or an audio filter.

In spite of these limitations, the operators copied the EME signals via the small internal speaker. This proved a bit difficult at times because the noisy power generator was only 10 meters away from them. Furthermore, they had some trouble with the generator and battery charger. Because of this, they estimate that they had only 80 watts at the antennas. However, they had no wattmeter to confirm this.

Their operation was set up over the two days of November 8–9. There was a restriction in that the station had to be disassembled by 6 AM Monday to accommodate 8 AM classes at the institute where the station was located.

Despite limitations, their operation was rather successful. Eric reported the following via the Moon-Net e-mail reflector:

Operators EL2DT, EL2JH, and I want to thank all the stations who called us at EL2RL and congratulate the fellows who heard our QRPP signal. We had good contacts with SM5FRH, SM5BSZ, KB8RQ, W5UN, and WA9KRT. Also heard was VE3KDH with a perfectly copiable signal for about an hour, but we couldn't get a report from him.

The two Liberian hams were calling by turn with a straight key. They operated instinctively, without help from me. All calls were fully copied 100 percent by them before sending any report.

Next time (January 1999?), we hope to operate with a decent transceiver and a preamplifier. Special thanks to Jorge, EA2LU, who offered us to alert the EME community on a very short notice.

Delayed Space Station Schedule Postpones ARISS

The following is from the "ARRL Letter," Electronic Edition, October 9, 1998:

Delays in the start of construction for the International Space Station will postpone the permanent presence of ham radio in space. After meeting with a NASA delegation late last week, the Russian Space Agency rescheduled the launch of the first crew to early next year. Originally set for launch next summer, the first crew now will go into space in January 2000. "So, you won't have an Amateur Radio signal coming out of the ISS until then," said NASA's SAREX Principal Investigator Matt Bordelon, KC5BTL.

The first crew will consist of U.S. astronaut William M. Shepherd, as the expedition commander. Shepherd is studying for his ham ticket. Accompanying him will be Russian cosmonauts Yuri Gidzenko and Sergei Krikalev, U5MIR. All three have previous space flight experience. The crew has been training for their launch on a Soyuz vehicle and a planned five-month mission on the ISS.

The change in launch date was blamed on budget-based delays in Russia's completion of the Functional Cargo Block or service module for the ISS. Launch of the service module now is set for next July. The service module is the section of the ISS in which astronauts and cosmonauts will live during construction and will be ham radio's first permanent beachhead in space. Russia's financial woes have put its space program well behind the curve in recent months.

At the same meetings between U.S. and Russian space officials last week, Russia agreed to sell its research time aboard the first phase of the ISS and unspecified hardware to the U.S. for $60 million.

The latest delay means that permanent Amateur Radio on the International Space Station (ARISS) equipment will not be on the air until after the Russian service module is in space and occupied. However, Amateur Radio has been manifested aboard the ISS as "necessary crew equipment."

Once aboard the ISS, ham radio, through the SAREX program, will serve as an educational tool through worldwide school contacts and as an outreach to the general public.

Schools in Four States on Next SAREX QSO Schedule

The following is from the "ARRL Letter," Electronic Edition, October 9, 1998:

Schools in Indiana, Rhode Island, Texas, and Virginia are on the schedule to make Amateur Radio contact with the astronauts aboard the space shuttle *Columbia* next year as part of the Space Amateur Radio EXperiment, or SAREX, program. The four-day flight, mission STS-93, is tentatively set for launch January 21.

Hams aboard STS-93 are Commander Eileen Collins, KD5EDS, Michel Tognini, KD5EJZ, and Catherine Coleman, KC5ZTH. Other crew members are Jeffrey Ashby and Steven Hawley.

If all goes as planned, students at each school will get a chance to directly interview the astronauts via a ham radio linkup. Typical passes last approximately 10 minutes. Specific times and dates of the school contacts have not yet been arranged.

For more information on the SAREX program, contact Jean Wolfgang, WB3IOS, e-mail <jwolfgang@arrl.org.jwolfgang@arrl.org>.

Discovery Launches PANSAT Spread Spectrum Satellite

The following is from the "ARRL Letter," November 13, 1998:

PANSAT, the Petite Amateur Navy Satellite, was launched over Australia October 30 from the space shuttle *Discovery*. The 150 pound Amateur Radio satellite carries a spread-spectrum communication package fabricated by student officers and faculty members at the Naval Postgraduate School as an educational project and a means of demonstrating spread-spectrum communication. It was launched from *Discovery* as part of the third International Extreme Ultraviolet Hitchhiker (IEH-3) experiment.

The NPS says the spacecraft will provide store-and-forward digital packet communication using direct-sequence spread-spectrum modulation with a center frequency of 436.5 MHz, a bit rate of 9842 bps, and 9 MB of message storage. According to the NPS Web site, "Amateur Radio ground stations will be able to utilize PANSAT via a bulletin-board-type user interface." PANSAT's Dan Sakoda, KD6DRA, says the team is doing initial assessments and has heard a reply signal from the spacecraft. But the ground crew has not yet been successful connecting via modems. "We've still got some bugs to shake out of our ground system," Sakoda said this week. He explained that the satellite does not have a beacon and only transmits when commanded to do so from the ground. "The fact that we saw PANSAT's response means that the satellite is working properly," he said. Sakoda does not expect PANSAT to be available to the Amateur Radio community for another couple of months.

PANSAT has 18 body-mounted solar panels and four monopole antennas that provide omnidirectional coverage, so it does not need an attitude-control system. It was expected to achieve a low-Earth orbit (300 nautical miles) with an orbital plane of 28.45° and have a lifetime of up to six years.

According to the PANSAT web site, the pseudo-noise (PN) code used for spreading is one of the already approved codes for Amateur Radio spread spectrum, using a 7-bit shift register with taps at 7 and 1, and one sequence length per bit of information.

New Mini-Sputnik Launched from MIR

The following is from the "ARRL Letter," November 6, 1998:

Russian cosmonauts launched a second mini-Sputnik satellite November 10 during a spacewalk from the *Mir* space station. The launch of *Sputnik 41*—also being called *RS-18*—comes just over a year after the launch of *Sputnik 40*, which commemorated the launch of the first artificial Earth satellite by the USSR in 1957.

Among the first in the U.S. to report hearing the new satellite was Ken Carlstrom, N1WED, in New Hampshire. He reported hearing *Sputnik 41* from approximately 0604 to 0609 UTC November 11 on 145.8145 MHz.

The newest Sputnik was tossed by hand at the start of the spacewalk by cosmonauts Gennady Padalka and Sergei Avdeyev. According to an AP report, Padalka told Avdeyev to "toss it gently toward the moon."

Sputnik 41, which arrived on *Mir* aboard a Progress supply rocket late last month, was financed by the *Aeroclub de France* to mark its centennial. Two *Sputnik 40* models were transported to *Mir* last year, but only one was launched. The other remains aboard the space station.

Like its predecessor, *Sputnik 41* is just under 8 inches in diameter and weighs almost 9 pounds. It carries a 200 mw transmitter that transmits on or about 145.812 MHz (± 5 kHz and Doppler shift). The spacecraft has no solar cells. Its expected operational lifetime is approximately 30 days.

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and Russian. The Russian-accented English greetings say "1998 was the International Year of Air and Space" and "International Space School Sputnik Program." The French and Russian messages convey the same greetings. The new spacecraft provides a "bip-bip" beacon. The frequency of the audio tone indicates the satellite's internal temperature (see chart). The tone is transmitted every 90 seconds.

Sputnik 41 reception reports go to AMSAT-France, QSL Sputnik 41, 14 bis rue des Gourlis, F-92500 Rueil-Malmaison, France. The 1998 International Year of Air and Space page is at <http://www.ccr.jussieu.fr/physio/Satedu/sputnik41.html>.

Current Contests

ARRL VHF Sweepstakes: This annual winter classic takes place between 16–18 January, beginning at 1800 UTC 16 January and ending at 0300 UTC 18 January. Exchange is your grid square. This is the only VHF contest that features club competition. The complete rules appear in December 1998 *QST*. The rules, plus log/summary sheets, are also available electronically from the League from several different sources, including their bulletin board (860-594-0306), and their home page (http://www.arrl.org) via the World Wide Web. As always, send or electronically file your log and summary sheets to the League.

Current Meteor Showers

The *Quads:* The *Quadrantids*, or *Quads*, is a brief, but very active meteor shower. Expected peak is around 0620 UTC on 4 January. The actual peak can occur ±3 hours of the predicted peak. The best paths are north-south. Long-duration meteors can be expected about 1± hours after the predicted peak. As always, look to 3818 or 3843 kHz in the evening hours for opportunities for schedules.

Don Sinnock, WØRWH, SK

The following is from Lionel, VE7BQH, via the Moon-Net reflector:

This message is to advise you Don Sinnock, WØRWH, passed away on Saturday, October 24,1998. He was 58 years old. Don had been ill with cancer for some years but had been living a very happy life with his family. He had built a very formidable 16-antenna M² 19XXX array during these years and had been enjoying the fruits of his efforts with many EME contacts. Don will be missed by all of us.

And Finally . . .

How little do we appreciate how much we have? The story of the Liberian amateurs' struggle to get on EME reminded me that we have so very much for which we should be thankful. Most of the readers of this column are in areas of the world which are blessed with abundance. Yet even those of us who are less fortunate than others often experience what the authors of the book *Uncommon Fire* describe as unfulfilled altruism. Those of us who become aware of this need to express our altruistic feelings find ways of doing so sometimes in the most unique avenues. Eric, EA5GIY, is an example of one such individual who went way out of his way to assist his fellow amateurs in a country ravaged by war.

How can we become involved in helping our fellow humans? Most of us cannot travel thousands of miles because we cannot afford to do so. Yet needs abound right at our doorstep. All we have to do is look and think. For example, most major cities have an office of Habitat for Humanity. Habitat for Humanity is an international organization which specializes in helping people, who normally would not be able to do so, acquire a home of their own. Habitat carries out its mission by building or doing major refurbishing of houses. It is in constant need of volunteers to assist in this construction work. You don't need talent to work for Habitat. If you know which end of a paintbrush to pick up, you can do the work.

Habitat for Humanity is but one organization that needs your help. I am sure that you can find many, many more if you just decide to put down your microphone for a little while and do so. Perhaps this could be your New Year's resolution.

Until next month . . .

73, Joe, N6CL

References

1. Peter O. Taylor, *Observing the Sun*, Cambridge University Press, 1991. It's interesting to note that indirect correlation to this prediction existed some 17 years earlier. In a phone conversation I had with Dr. John A. (Jack) Eddy, the subject of my July 1976 *QST* article on the Maunder Minimum, he expressed the feeling that we were headed for another Grand Maximum of a long-term solar cycle that stretches into 200–300 years in periodicity and that this maximum would probably occur within the 21st century.

2. Excerpt from a Brief that appeared in August 1945 *QST*, page 12.

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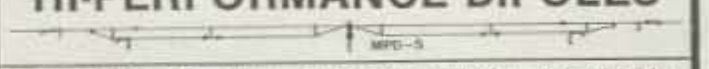

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BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Maximizing Your Contest Scores in 1999

January's Contest Tip of the Month

It's 2345Z on Friday night. You've just turned on your radio and you're now ready to go, right? Well, probably not. It is always a *better* approach to check the bands at sunrise and sunset daily toward the end of the week to get a feel for the prevailing conditions *before* the contest. Here are some good questions to ask: Has the flux been falling or rising? When did 10 meters open to Europe yesterday and the day before? Has 15 meters been good to JA around 2400Z (the start of the contest)? The moral of the story is check bands mid- to late-week. You'll be glad you did, and your score will reflect the difference in the end! *(Tnx YCCC)*

Let's be honest with ourselves and admit that nothing improves a contest score more than good old-fashioned experience and improved station hardware. Despite that reality, there is still hope for *all* of us who want to improve. Many of the ways we can enhance our results have nothing to do with the size of our antennas or the number of years we have been contesting. Hopefully, you will gain some insights from the suggestions in this month's column.

The idea for this column was born out of an old but effective concept that has been used by the Yankee Clipper Contest Club for years. We call it "Contest University." The intent is on a weeknight evening to share ideas about contesting fundamentals, including operating and preparation techniques that have been used by some of the club's successful contesters. Entrance requirements into the university are simple: a contester's transcript detailing past contest scores (the lower the better) and a desire to improve! In most cases, we waive the transcript requisite, but dozens of contesters arrive with a desire to brainstorm about one of the great questions of contesting: How can I get better at this stuff?

I have divided my thoughts this month into several categories that include physical considerations, operating, food/drink, station design, preparation, and other. I'm sure there are additional categories, too. As you read on, consider your own little tricks. At the risk of letting a few secrets out, your insight may help your fellow contester—if you only share!

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CALENDAR OF EVENTS

Dec. 26-27	Stew Perry Topband Challenge
Dec. 27	RAC Canada Winter Contest
Jan. 1	ARRL Straight Key Night
Jan. 2	Kid's Day Operating Event
Jan. 2-3	ARRL RTTY Roundup
Jan. 8-10	Japan Low Band Int. DX Contest
Jan. 9-10	Hunting LIONS in the Air
Jan. 9-10	North American CW QSO Party
Jan. 9-10	YL-OM Mid-Winter Contest
Jan. 16	LZ Open Championship 1998
Jan. 16-17	MI-QRP Club Jan. CW Contest
Jan. 16-17	North American QSO Party
Jan. 17	HA DX Contest
Jan. 23-25	ARRL VHF Sweepstakes
Jan. 29-31	**CQ WW 160 Meter CW Contest**
Jan. 30-31	REF CW Contest
Jan. 30-31	UBA SSB DX Contest
Feb. 6-7	New Hampshire QSO Party
Feb. 6-7	Vermont QSO Party
Feb. 6-8	Delaware QSO Party
Feb. 13-14	World Wide RTTY WPX Contest
Feb. 20-21	ARRL Int'l DX CW Contest
Feb. 26-28	**CQ WW 160 Meter SSB Contest**

Physical. There are few specialties in amateur radio more physically grueling than slugging it out for 48 hours in a major DX contest. Serious contesters don't take physical preparation lightly and consider this aspect to be as important as the station itself. For example:

- Try to get a good nap on the Friday afternoon before the contest.
- Try operating while standing up for short stretches.
- Don't be afraid to take short breaks during the contest. Try going for a 5 minute walk to clear your head.
- Wear loose/comfortable clothes, and dress enough to stay warm, not hot.
- Change into fresh clothes periodically.
- Open windows from time to time.
- Take one or more showers during the weekend.

Operating. While there is some merit to the concept that operating ability is partly natural, the truth is that the majority of good operators have learned their skills through experience. Operating ability is more than being able to copy the information you are being asked to receive. It's also a function of aggressiveness and operating with common sense. For example:

- Don't listen/worry about your competition.
- Transmit the minimum amount of data necessary to complete the QSO. Don't be a chatty contester!
- Use that RIT, especially on CW, but make sure that station you hear is calling *you!*
- Dig for weak signals. Sometimes it's just QSB.
- Split your operating into different parts of the band. Don't get stuck in one area for the entire contest.
- Consider special frequencies: slightly up from nets (while not QRMing them!), way up into bands.
- Don't get stuck trying to run guys when you can't. Search and pounce can produce good rates.
- Track your QSO/Mult ratios. This can be a guide in determining the time you should spend calling in pile-ups.
- Use propagation tools to find openings for you (DX-Edge, computer S/W, etc.).
- Be aggressive when operating.
- Don't be caught "DXing" when you should be running guys.
- Never miss easy multipliers. Always be aware of what you have and what you need.
- Always operate on the highest band open to Europe in the AM.
- Use your VFO memories to store sked frequencies, pile-ups, etc.
- Operate where others aren't from time to time.
- Don't be afraid to start moving needed multipliers to other bands in the beginning of the contest.

Food/Drink. The choice of food and drink during a contest is largely one of personal choice. The advantage comes from developing a plan. In most cases:

- Avoid a big meal right before the contest starts.
- Coffee, No-Doz®, cola—just choose your weapon.
- Consider your meal plan for the weekend, focusing on high-energy foods, and consider food choices that are quick to prepare. Crockpot dishes (e.g., stew, soups) are good choices, as are microwave dinners.
- No booze!!
- Drink lots of fluids during the contest.

Station Design. The old adage is that the internal layout of your station plays an incredible role in reducing Sunday afternoon fatigue. Why compromise the advantage of phased verticals by labeling them poorly? You should not have to hop into your car to get to your antenna switch. And, there are others:

- Label everything in your shack (e.g., antenna switches, remote switches, keyer memories, etc.)

Say You Saw It In CQ

• Label amplifier settings per band.
• Review your station setup. Everything should be positioned for maximum comfort and reduced back strain.
• Use a comfortable operating chair (not *too* comfortable, though).
• Ensure good lighting.
• Evaluate your headphones. They can ruin the advantage of a good receiver.
• Try setting up a second radio for spotting/listening.
• Use a boom microphone/headset.
• Clean up your shack for psychological advantages.
• Try using voice keyers.

Preparation. Being properly prepared for a contest is the single most important contribution to improving your contest score. Successful marathon runners don't just show up for their races. Rather, they prepare for months and even years. A contest is not unlike a marathon. Although everyone isn't a winner, successful participants excel based on their mental *and* physical preparation. The improving contester can:

• Prepare so that all you need to do on Friday is sit down and operate.
• Understand propagation before and during the contest.
• Work the bands vigorously during the week before the contest to understand who's on and their game plans.
• Have a plan for spare equipment (including PCs) if something fails during the contest.
• Plan the contest as if you were attempting to run the Boston Marathon.
• Use two alarm clocks set 5 minutes apart as a backup during rest periods.
• Use alarms that are battery powered to avoid power disruptions.
• Have a good understanding of last year's efforts, especially where you made good band decisions.
• Have a good supply of yellow stickies for note taking.
• Set goals for yourself and try to exceed them. Not everyone wins!
• Excel at band changing in your station.
• Know the rules inside and out (e.g., the 10-minute rule, multiplier credits, etc.).
• Practice various operating scenarios with your radio (setting up a "quick" split on 40 meters, doing an A = B with your VFOs to tell a guy the frequency is busy, and so on).

Other Considerations. There are countless other thoughts about improved contest scoring. These include:

• Tape record your operation and listen for mistakes and areas of improvement for the next time.
• Operate in small contests during the year to develop your skills.
• Try to find a friend to operate with; exchange ideas from time to time.
• Try to identify and fix potential TVI/RFI

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problems *before* the contest. Have a plan established to deal with possible problems (for example, pre-made power cords with toroids).

• Answer your bureau QSLs. DX stations *really do* remember.

And Finally, Our 1999 Contest Resolutions

The idea of contest resolutions has become a bit of a tradition in this column, and fellow contesters, that time of year has again come upon us. In addition to our never-ending attempts to initiate exercise programs, spend more time with our families, improve our work ethic, and commit to more disciplined financial planning, there is the issue of being a better contester in 1999. Here's a fun list for you to consider:

• I will always sign my entire callsign in every contest.

• I will never intentionally take someone else's frequency.

• I will never log a QSO unless I am absolutely sure of the exchange and callsign.

• I will religiously repeat the entire callsign of the station I am working during each QSO.

• I will always verify the callsign of the station I am working from a DX spot on packet before logging him.

• My logs will always be submitted before the mailing deadline.

• I will plan this year's antenna projects during the winter and begin construction on the first warm spring weekend.

• My entire station will be ready for the fall operating season 30 days before the start of the CQ WW DX SSB Contest.

• I will always solder the ground on my PL-259 connections.

• I promise to answer all of my incoming bureau QSL cards.

• I will be sure to respond to the next *CQ* magazine "Contest Calendar" survey.

• I will periodically check to see if someone else wants to operate when participating at a multi-op.

• I will always act as if I were using *my* callsign when operating from someone else's station in the next contest.

Closing Comments

That's it for this month. Propagation is back, promising a great 1999 for contest operation. Make 1999 *your* operating year, however you choose to define that!

As always, I need to receive your "Contest Calendar" submissions for the April issue no later than February 1st.

73, John, K1AR

Errata 1997 CQ WW DX Contests

SSB

1. W4YV was listed as all band but was really 28 MHz, #1 4th call area and #2 USA.
2. PAØMIR was left off the SSB Copying Honor Roll with only a 1.0% QSO and 5.8% score reduction.
3. The operator of LZ1ZU was Mike, not LZ5QZ.
4. W7SE is in Zone 4 (WY).
5. V29NR (YU1NR) was Low Power and #2 14 MHz in the world.
6. HA6NF should be bold and was a certificate winner.
7. DK3DM should be bold and was a certificate winner.
8. KR2Q set a new USA 7 MHz record.
9. II3T (IV3TAN) was the winner of the European 21 MHz trophy, not 4O6A whose score was a typo and equaled 1,098,046.
10. The #1 score in Spain was EA4KD. EA3NY's score was listed incorrectly; he finished #2.
11. N8CN was Low Power not HP as printed. He was #1 LP in 8th area.
12. S54E was the #1 European Low Power 1.8 MHz score, not HA8BE as shown in Top Scores

CW

1. JL4CVG's score was not listed. It was LP 28 MHz with a score of 14,691/105 /23/36; #1 in Japan.
2. The Japan MM Trophy was won by JH5ZJS (JA5BJC, JA5FDJ, JH5RXS, JR5JAQ, JR5PDX, JR5VHU, JL2TAW). JH7PKU won the MS trophy.
3. HB9CPS should have been bold as a certificate winner.
4. QRP: WA9FWO/4 was the high 4 area AB score and is a certificate winner.
5. JA2BY was Low Power and #2 in Japan.
6. K2FU was incorrectly listed as a SSB score. His Assisted CW score was 903,890/743/114/328.
7. N2NT was #4 in Zone 5 and N2LT was #5. Both were left off the Most Active Zone box.
8. The #10 QRP AB score in the USA was W8QZA/6 and is a certificate winner. KV8S' score was listed in the wrong place.
9. W2GG/3 was assisted. WW3S was the #1 3rd area Low Power AB score.
10. WC1M and W1ZT Assisted scores are out of order.
11. N2LBR operator list should be in the MS section.
12. WC1D was an op at the MS N1AU. N1GS was an op at the MS W1QK. W1RM was an op at the MM K1KI. AB2E, K3TEJ, and WA3WSJ were operators at V26KW.
13. K1GW operator list should be in the MM section.
14. The operator lists of KV0Q and N8PR/4 were out of alphabetical sequence.
15. J49IL(DJ5IL) was Low Power not HP as printed.

Club: The Florida Contest Club was not listed. Their score was 16,063,926, which placed them #12 in the US and #1 in Florida.

Kid's Day Operating Event

1800Z to 2400Z Sat., Jan. 2

Sponsored by the Boring Amateur Radio Club, the Kid's Day Operating Event is intended to encourage activity by younger people (licensed or not) using amateur radio. The goal is to give unlicensed young people some hands-on, on-the-air experience so they might develop an interest in pursuing a license in the future. It is also intended to give amateurs a chance to share their station with their children.

Exchange: Name, age, location, and favorite color. You are encouraged to work the same station again if either operator has changed. Call "CQ KIDS DAY."

Frequencies: 28350 to 28400 kHz and 14270 to 14300 kHz.

Logs, comments, and funny stories may be posted via the Internet to <kids@contesting.com>. You may review these postings by visiting <http://www.contesting.com/kids/> with your web browser. All verified participants will receive a colorful certificate. Please send an SASE to BARC, P.O. Box 1357, Boring, OR 97009. More details may be obtained from the Boring Amateur Radio Club or at <http://www.jzap.com/k7rat/>.

ARRL RTTY Roundup

1800Z Sat. to 2400Z Sun., Jan. 2–3

This is the 11th annual all-digital contest sponsored by the ARRL. Any station may work any other station worldwide. You may operate more than one digital mode, but QSOs and multipliers are counted once only regardless of modes used.

Operation is limited to 24 hours out of the 30-hour contest period. Two rest periods must be taken in two separate blocks of time and clearly marked in the log.

Modes: Baudot, RTTY, ASCII, AMTOR, and packet (attended operation, only).

Bands: 3.5–30 MHz on those frequencies recommended for digital operation (no 10, 18, or 24 MHz).

Categories: Single operator, multi-band, (1) less than 150 watts output, (2) 150 watts or more; multi-operator, single transmitter, all band.

Exchange: Signal report and QTH. State for the U.S., province for Canada. DX will send a serial QSO number.

Scoring: One point per QSO. A station may be worked once per band for QSO credit.

Multiplier: Each US state (48), each VE province (12), and each DXCC country, counted only once, not once per band (KH6 and KL7 are countries; VO1/VO2 counts as one VE province).

Entries with 200 or more contacts must submit a duplicate QSO check sheet.

Awards: Certificates to the top-single operator, both low and high power, and multi-operator scorers in each ARRL/RAC section, and each DXCC country. Novice/Tech entrant with at least 50 QSOs will also receive a certificate.

Contest forms are available from the ARRL for an SASE and two units of first-class mail and are recommended.

Entries must be postmarked no later than 30 days after the end of the contest. Mail entry to: ARRL RTTY Roundup, 225 Main St., Newington, CT 06111 USA. E-mail logs to: <contest@arrl.org.> These logs must be in ASCII format. The log data file and the summary sheet must consist of the callsign and the extension (i.e., xxxx.log and xxxx.sum).

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Japan Int'l DX CW Contest (Low Band)

2200Z Fri. to 2200Z Sun., Jan. 8–10

The object for this one is for amateurs around the world to work as many JA stations in as many JA prefectures as possible. It is sponsored by *Five-Nine* magazine. The maximum operating period is 30 hours (except for JAs, who can use the full 48-hour period) with off periods longer than 60 minutes. This is the low-band edition (others to follow in subsequent months), and operation is limited to 160–40 meters, exclusively.

Classes: Single Operator High Power/Low Power/All Band/Single Band; Multi-Operator; and maritime mobile.

Exchange: JA-RST and prefecture number (1–50); others send RST and *CQ* Zone.

Scoring: 160 meters 4 points, 80 meters 2 points, 40 meters 1 point per QSO. Multipliers are total prefectures worked per band (DXCC countries for JA). Final score is total QSO points times multiplier.

Awards: Plaques and awards will be sent to the winners in each class around the world. A special contest award will be offered to anyone working all Japanese prefectures during the contest period.

All logs must be postmarked no later than February 28th and should be sent to: JIDX LFCW Contest, c/o *Five-Nine* magazine, P.O. Box 59, Kamata, Tokyo, 144 Japan. E-mail log submissions will be judged with the time stamp of the e-mail and should be sent to: <jidx-log@dumpty.nal.go.jp>. Contest results will be sent to anyone including one IRC and an SAE.

1998 North American QSO Party

CW: 1800Z Sat. to 0600Z Sun., Jan. 9–10
SSB: 1800Z Sat. To 0600Z Sun., Jan. 16–17

The object of this one is to work as many North American stations (and/or other stations if you are in North America) as possible during the contest period. North American stations are defined by the rules of the CQ WW DX Contests with the addition of KH6.

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9913/PIN	N Male Pin for 9913, 9086, 8214 Fits UG-21 D/U & UG-21 B/UN's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	4.00
UG-21B/9913	N Male for RG-8 with 9913 Pin	6.00
UG-146A/U	N Male to SO-239, Teflon USA	7.50
UG-83B/U	N Female to PL-259, Teflon USA	7.50

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Classes: Single Operator and Multi-Operator, two transmitters. Multi-Operator stations shall keep a separate log for each transmitter and must have at least 10 minutes between band changes. Use of helpers or spotting nets by single operator entries is not permitted. Single operator entrants may only have one transmitted signal at a time. Output power must be limited to 150 watts for eligible entries. Multi-Operator stations may operate for the entire 12-hour period. Single Operator stations may operate 10 out of 12 hours. Off times must be at least 30 minutes in length and must be clearly marked in the log.

Mode: CW only in CW parties. Phone only in phone parties.

Bands: 160–10 meters only (no WARC bands). You may work a station once per band. Suggested frequencies are 1815, 3535, 7035, 14035, 21035, and 28035 (20 kHz up from band edge for Novice) on CW; and 1865, 3850, 7225, 14250, 21300, and 28450 on phone. Try 10 meters at 1900Z and 2000Z, 15 meters at 1930Z and 2030Z, and 160 meters at 0430Z and 0530Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian call areas (VE1–VE8, VO1, VO2, VY1, and VY2) and other North American countries. Do not count USA, Canada, KH6, or KL7 as countries. Non-North American countries do not count as multipliers, but may be worked for QSO credit.

Team Competition: Team competition is limited to a maximum of five single operator stations (two minimum) as a single entry unit. *Pre-contest Requirement:* To qualify as a team entry, you must register the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his own (e.g., N4RJ op. by W4AN). Teams must be registered with the contest director before the contest.

Penalties: For each unmarked duplicate QSO, you lose that contact plus an additional three contacts; for each QSO for which you are not in the other station's log, you lose that QSO plus an additional one contact; and for each QSO for which the log data is incorrectly copied in any respect, you lose that contact. Entries with score reductions greater than 5% will be disqualified.

Awards: A total of five trophies will be awarded for the high score in each of the following categories: Single Operator CW and Phone, Multi-Operator CW and Phone, and Single Operator Combined score. Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each state, province, and North American country.

Send CW North American QSO Party entries to Bob Selbrede, K6ZZ, 6200 Natoma Ave., Mojave, CA 93501. All SSB logs go to: Bruce Horn, WA7BNM, 4225 Farmdale Ave., Studio City, CA 91604. Entries must be postmarked no later than 30 days after the party to be eligible for awards. E-mail log submissions *must be* in ASCII text format and include your summary sheet and complete log. Name your files with your callsign (i.e., yourcall.SUM and yourcall.LOG). Please do not send any binary format logs (i.e., yourcall.BIN or yourcall.QDF). NAQP CW logs should be sent to <w9nq@ccis.com> and NAQP SSB logs go to <bhorn@hornucopia.com>.

HA DX Contest

0000Z to 2400Z Sun., Jan. 17

Sponsored by the Hungarian Radioamateur Society, this is one of several very popular Eastern European national contests. The contest is CW only and stations may be only worked once per band.

Classes: Single Op. Single Band, Single Op All Band, Multi Op. Single Transmitter, Multi-Op Multi-Transmitter, and SWL.

Exchange: RST plus serial number (599001). HA stations will also send a two-letter code corresponding to their county. The possible codes are: BA, BE, BP, BN, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA.

Scoring: Count 6 points per HA QSO and 3 points for non-HA QSOs on other continents. Final score is total QSO points times sum of HA counties worked per band.

Entries are due six weeks after the contest and should be sent to: Hungarian DX Club, Box 79, Paks, H-7031 Hungary.

ARRL VHF Sweepstakes

1900Z Sat. to 0400Z Mon., Jan 23–25

This is the 52nd ARRL January VHF Sweepstakes. ARRL Headquarters recommends that you use the official log forms. The forms will help make your log keeping and scoring much easier. A large SASE to Newington will get you the necessary forms.

Complete rules will be found on ARRL's Web site at <www.arrl.org>. They are a bit complicated, so look them over carefully.

CQ WW 160 Meter Contest

CW: Jan. 29–31 SSB: Feb. 26–28
2200Z Friday to 1600Z Sunday

Complete rules were published in the November issue. The following is a brief overview.

Exchange: RS(T) and QTH. State for the U.S., areas for Canada, country abbreviation for DX.

Scoring: Contacts with stations in own country 2 points, other countries in same continent 5 points, and other continents 10 points.

Multiplier: Each U.S. state (48), Canadian area (13), and DX country. (ARRL and WAE country lists and WAC boundaries are the standards.) Note that Washington, D.C. is now a multiplier (same as state).

Awards: Certificates to the top-scoring stations in each U.S. state, Canadian area, and DX country will be awarded, as well as an assortment of plaques for U.S. and world winners.

Penalties: Three contacts will be deleted for each duplicate that has not been removed.

Disqualification: Taking credit for excessive duplicate contacts, and the usual rules violations and unsportsmanlike conduct.

Mailing deadline for logs is February 28th for CW entries and March 31st for SSB.

Logs should be sent directly to: CQ 160 Meter Contest, David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092. *Be sure to indicate CW or SSB on the envelope.*

Say You Saw It In CQ

U.B.A. Contest

Phone: 1300Z Sat. to 1300Z Sun. Jan. 30–31
CW: 1300Z Sat. To 1300Z Sun. Feb. 27–28

This one is sponsored by the Belgium Amateur Radio Union (U.B.A.) and is any station working any other worldwide. Numerous operating awards are available, and contest QSOs may be credited towards these awards.

Classes: Five categories exist—Single Operator All Band/Single Band, Multi-Operator/Single Transmitter, QRP 5 watts, and SWL. In all categories *only one* transceiver (or receiver) is allowed at any time during the contest. Only one (1) transmitted signal is permitted at any time during the contest, so *no* multiplier station permitted. The use of DX Cluster facilities is permitted for all categories.

Frequencies: CW—3500–3560, 7000–7035, 1400–14060, 21000–21060, 28000–28060 kHz. SSB—3600–3650, 3700–3800, 7040–7100, 14125–14300, 21175–21350, 28400–28700 kHz. Note that ON stations are only allowed 1830 to 1850 kHz on 160. It is mandatory to respect the IARU Region I band plan and the IARU Region I contest preferred frequencies.

Exchange: RS(T) and consecutive serial number. Belgian stations also give their province abbreviation.

Multipliers: All Belgian provinces, prefixes: ON4-9, DA1-2, and European Community countries. A QSO with a Belgian station can give you two multipliers, province and prefix.

Scoring: QSOs with ON count 10 points. European QSOs count 3 points. All others are 1 point. Final score is total QSO points times total multipliers.

Awards: There are several awards available, including trophies and certificates to the high scorers in each operating class. Note that the 12th European Union Trophy will be awarded to the highest scoring EU member station from both the CW and SSB Class B competition.

Send your final results no later than 30 days after each contest mode to: UBAHF Contest Committee, Carine Ramon, ON7LX, Bruggesteenweg 77, B-8755 Ruiselede, Belgium. Logs via e-mail are accepted at <ON7TK-ON7LX @innet.be>. A confirmation will be send when the log arrives.

1999 REF Contest

CW: 0600Z Sat. to 1800Z Sun., Jan. 30–31
SSB: 0600Z Sat. To 1800Z Sun., Feb. 27–28

The Reseau des Emetteurs Francais (REF) has the honor of inviting radio amateurs from around the world to participate in the REF Contest. The object of the contest is to establish as many QSOs as possible between radio amateurs around the world and French stations. French stations are defined as (1) stations from France and Corsica, (2) French military stations in Germany, and (3) overseas territories and departments (i.e., FG, FH, FJ, FK, FM, FO, FP, FR, FS, FT, FW, FY). Operation is on 80–10 meters, only (no WARC bands).

Classes: Single Operator, All Band and Single Band, Multi-Single, SWL.

Exchange: RS(T) and serial number. French stations give RS(T) and their department number. Overseas territories use RS(T) and their prefix.

Scoring: Credit one point for QSOs within the same continent and three points for QSOs with another continent. All QSOs with "French Speaking Countries" stations are worth 5 points (C3, CN, D6, HB, HH, HI, J2, LX, OD, ON, TJ, TL, TN, TP2CE, TR, TT, TU, TY, TZ, VE2, XT, YJ, 3A, 3V, 3X, 4U1ITU, 5R, 5T, 5U, 5V, 6W, 7X). Multipliers are French departments, military stations, and territories per band. A special multiplier may be taken for working F6REF/00 per band.

Awards will be sent to the first-place Single- and Multi-Operator winner of each country. All logs must be received before March 15 (CW) and April 15 (SSB). Send your entries to: Reseau des Emetteurs Francais, REF Contest, BP 2129, 37071 Tours, Cedex, France.

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AEA

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Our latest product is the **CIA-HF Complex Impedance Analyzer** which displays four different curves representing **SWR, Resistance, Impedance and Reactance relative to frequency** over an operating range of **400 kHz to 54 MHz**. In addition, many other parameters can be displayed in digital format such as the **2:1 SWR limits** of a circuit or antenna under test, the **relative Q**, **Phase angle**, **Return Loss,** Inductance, Capacitance, Inductance or Capacitance to provide a **conjugate match**, **minimum SWR frequency and magnitude** within sweep range, normalized 50 ohm impedance and more. You can even use the CIA-HF to determine the **distance to the first short or open** in a coaxial cable, a useful feature for determining the length of a cable on a reel or in the ground. The CIA-HF also has a built-in serial port for interfacing with a PC. Future applications software will enable you to print out curves that will **knock your socks off**! The introductory price is only $359.95 plus Shipping and Handling (S&H).

Our SWR - 121 V/U gives you the ability to see a graphical display of SWR for antennas in the VHF and UHF ranges. This product gives you **Return Loss** and a **serial port** for computer operation or storage of curves. The SWR - 121 V/U covers a frequency range of 120-175, 200-225 and 400-475 MHz. The SWR - 121 V/U is priced at only $399.95 plus S&H.

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Campbell Island

This month DXers can look forward to an excellent opportunity to work one of the Top 50 Most Wanted countries—Auckland and Campbell Islands ZL9. A large and highly experienced group of DXpeditioners aims to depart New Zealand on the first day of the new year, with arrival at Campbell scheduled for January 9. The twelve-man team will operate under the callsign **ZL9CI** until January 25, giving everyone a good shot at this rare DXCC entity.

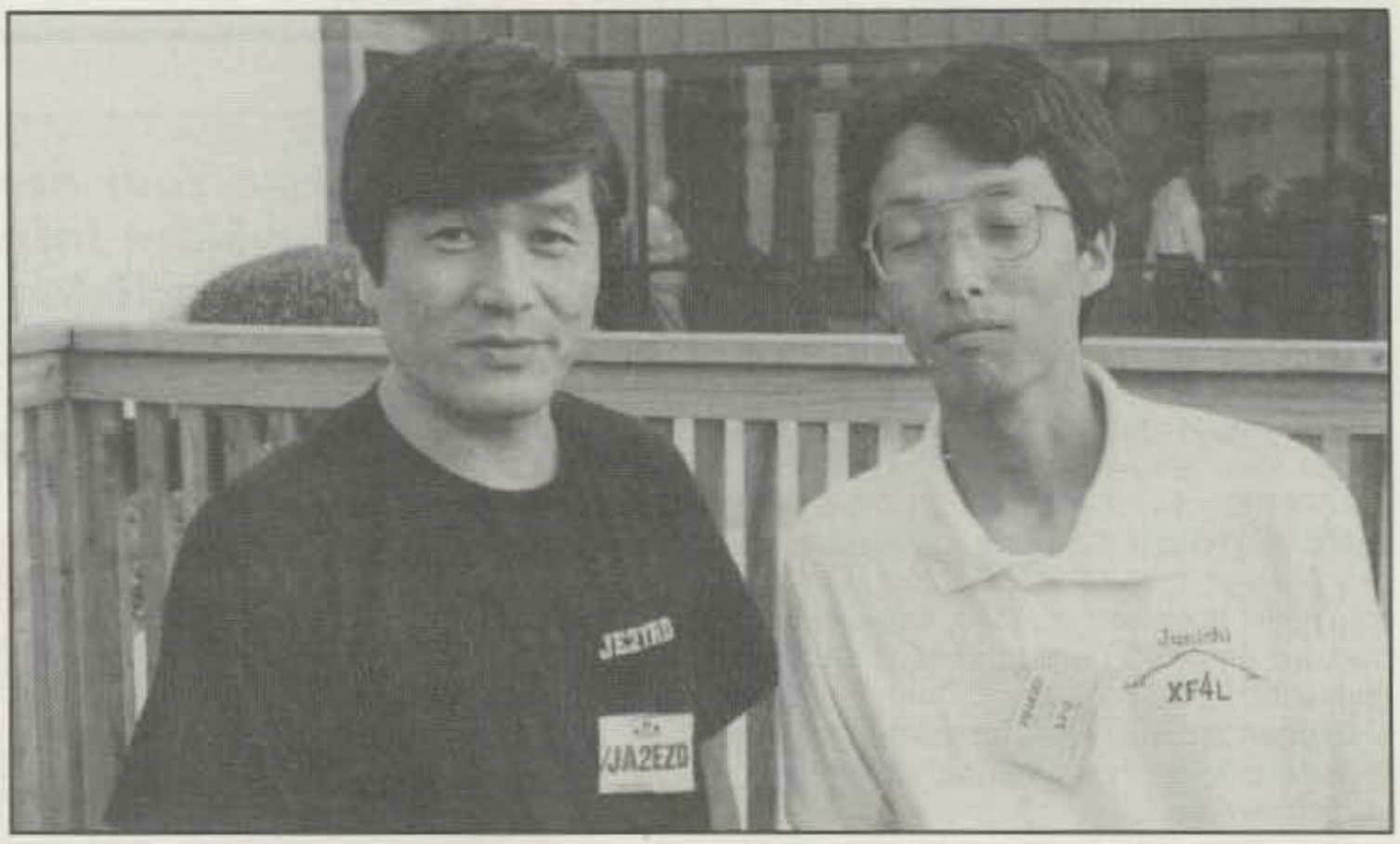
The DXpedition is under the guidance of the Kermadec DX Association, which did such an excellent job with the **ZL8RI** Kermadec operation in 1996. That operation earned the ARRL's DXpedition of the Year award that year. DXpedition leader is Ken Holdom, ZL2HU, leader of the ZL8RI operation and no stranger to the DXpedition circuit. Other New Zealand operators include Ron Willis, ZL2TT, and Lee Jennings, ZL2AL, both veterans of the ZL8RI operation; Murray, ZL1CN; and New Zealand Department of Conservation (DOC) staff member Jason Christensen, ZL2URN. Jason will represent the DOC on the trip.

Other team members include three operators from the Heard Island VKØIR DXpedition: Al Hernandez, K3VN, who has operated from several other Antarctic locations; Mike Mraz, N6MZ, who has experience on Wake, North Cooks, and Kerguelen, as well as Heard; and James Brooks, 9V1YC, also known as VS6WO. Other members of the DXpedition team are Brian Biggings, VE3XA; Declan Craig, EI6FR; Jun Tanaka, JH4RHF; and Andrew Williamson, GIØNWG. These ops are not newcomers to the DXpedition circuit either. Declan and Andrew are members of the WestNet DX Group, which has successfully activated many of the islands around England and Ireland, and Jun has a fine record of DXpeditioning from XF4, KP1, 3D2, and Pratas BV9P, among other locations. Such an experienced crew should ensure that all openings are carefully covered.

The list of equipment headed for Campbell highlights how extensive an operation is planned. Yaesu transceivers include four FT1000MPs, an FT1000, three FT900s, two FT920s, an FT990, and an FT655 for 6 meters. Amplifiers include three Command Technologies HF2500s and an HF1200; Yaesu VLX, FL7000, and FL2100B; and oldies of Heath SB220, Dentron Clipperton, and a separate amp for 6 meters. That's pretty heavy artillery for a country with a 150 watt power limit.

Antennas include two monobanders for each of the traditional higher bands, two tribanders, two 12/17 meter dualbanders, four-squares on 40 and 80, verticals on 160 and 30 meters, plus wire loops, 6 meter antennas, satellite gear, and more. Power will be generated by four 5 kilowatt diesel generators and a 2 kilowatt gas generator. Nine lap-top computers running CT will handle logging.

Getting all of this gear assembled, checked, tested, and finally landed on Campbell is no small undertaking. The Kermadec DX Association has leased the *Braveheart*, a 117 foot former Japanese fisheries research vessel, for the trip. The *Braveheart* is now based in New Zealand and is completing a major refit specifically for this operation. As might be guessed,



Jun Tanaka, JH4RHF, on the right, is one of the Campbell Island ZL9CI operators.

Three of the Heard Island VKØIR team will help man the ZL9CI stations. (ON6TT photo)

P.O. Box 50, Fulton, CA 95439
e-mail: chod@compuserve.com

Say You Saw It In CQ

The WPX Program

SSB

2690 .....WB6CGZ 2692 .....UA6LDD
2691 .....K1NU

CW

2997 .....K1NU

CW: 350 K1NU. 400 WA2VQV, K1NU. 450 K1NU. 500 K1NU. 550 K1NU. 1100 I1POR. 1150 I1POR. 1200 KT2C. 1700 IK3GER.

SSB: 350 K1NU. 400 K1NU. 450 K1NU. 500 K1NU. 550 KZ9A, N1SHM, K1NU. 600 N1SHM, K1NU. 650 CP2DL, K1NU. 700 CP2DL. 750 CP2DL. 1550 JR4NUN. 2300 KF7RU. 2350 I1POR, KF7RU. 2400 I1POR. 2450 I1POR. 2500 I1POR. 2550 I1POR. 3550 I2PJA. 3600 I2PJA. 3650 I2PJA.

Mixed: 450 HP1KZ. 500 HP1KZ. 550 HP1KZ. 600 HP1KZ. 650 AK7O, KZ9A, HP1KZ, WZ4P. 700 AK7O, WZ4P. 750 WZ4P. 950 K1NU. 1000 K1NU. 1150 VE6FR. 2900 I1POR. 2950 I1POR. 3000 I1POR. 3050 I1POR. 3100 I1POR. 3150 WB2YQH. 3550 I2PJA. 3600 I2PJA, F2YT. 3650 I2PJA, F2YT. 3700 F2YT. 3750 F2YT. 3800 F2YT. 3850 F2YT. 4350 W2FXA.

10 meters:RW9SG, K5YAA.
15 meters: RW9SG
20 meters: RW9SG
80 meters: KKØDX
160 meters: KKØDX

Asia: K1NU
So. America: RW9SG
Oceania: RW9SG

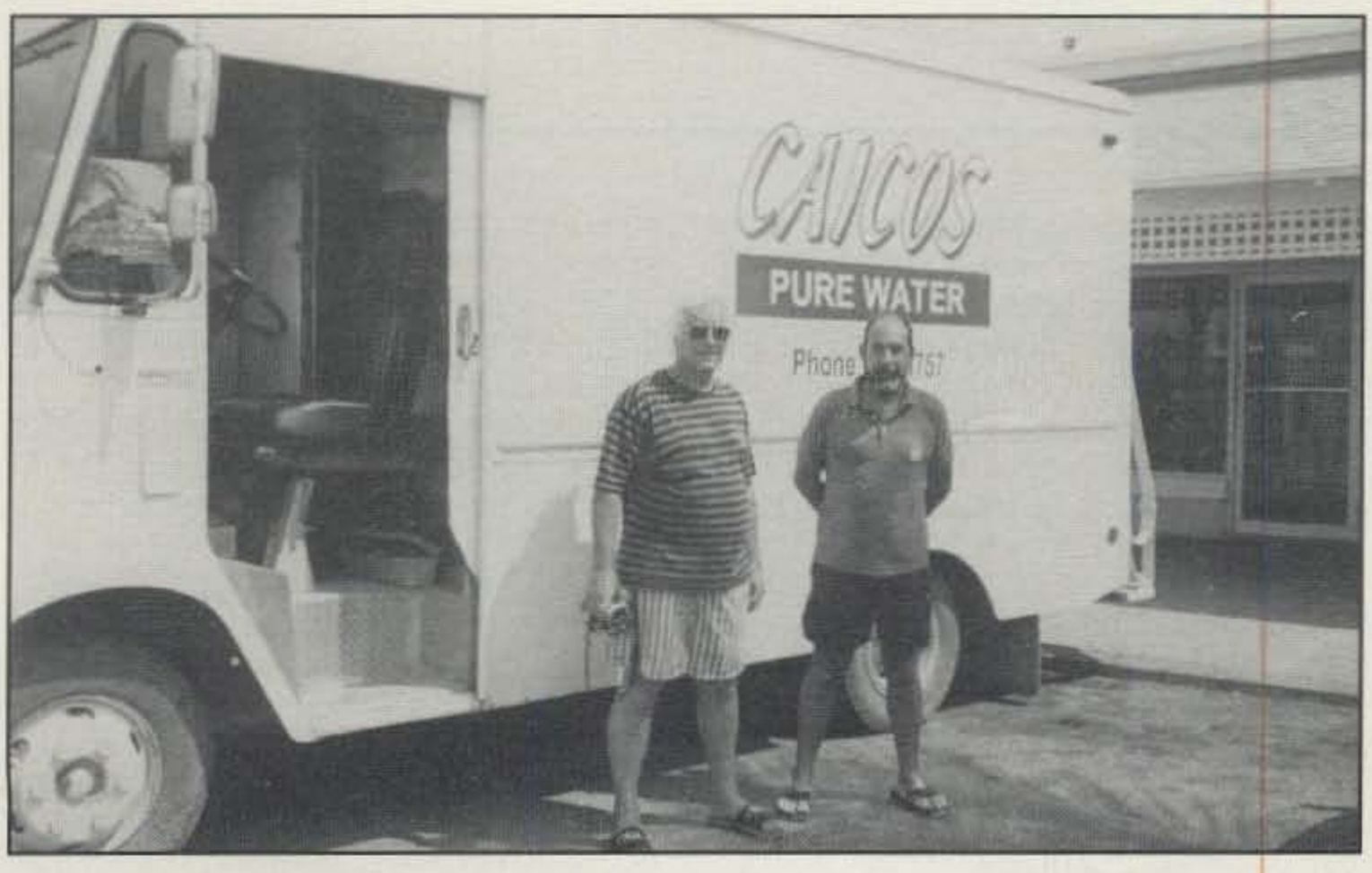
Award of Excellence Plaque Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, YU2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S5ØA, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, S57J, EA8BM, DL1EY, KUØA, KØDEQ, VR2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, I7PXV, N1KC.

Award of Excellence Plaque Holders with 160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, K9BG, W1BWS, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S5ØA, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, VR2UW, DJ3JSW, OE6CLD, HB9BIN, N1KC.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

all this comes at considerable cost. The boat charter alone will run about $70,000 with costs for generators, fuel, transportation to the boat, food, etc., exceeding another $15,000. The group welcomes contributions toward these costs. They may be sent to the Kermadec DX Association at P.O. Box 56099, Tawa, Wellington, New Zealand.

Auckland and Campbell Islands ranked 19th on the latest Most Wanted survey from *The DX Magazine*. The ZL9CI should satisfy essentially all of that demand. DXers on the US east coast will probably have to settle for contacts on the lower bands and 20 meters, according to a MiniProp Plus™ analysis. Look for openings on 80 and 40 meters during mutual



Mario, VP5/CX4CR, and Bert, VP5/CX3AN, of the Uruguay DX Group operated from VP5JM's shack in the Caicos.

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CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Currently there are 330 countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

CW

K2TQC 330
K2FL 330
K6JG 330
K2OWE 330
N4JF 330
K9BWQ 330
K3UA 329
N4MM 329
EA2IA 329
K2JLA 329
K1MEM 327
K2ENT 327
DL8CM 327
WØIZ 327
G4BWP 327
I4EAT 327
SM6CST 327
W2UE 327
W2FXA 327
K4KG 327
K8PV 327
W4QB 327
K6LEB 327
K9MM 327
F3AT 327
PAØXPQ 327
W6DN 327
I1JQJ 327
N7FU 326
IT9TQH 326
K4CEB 326
WA4IUM 326
K4IQJ 326
F3TH 326
NC9T 326
N7RO 326
KZ4V 326
9A2AA 325
OK1MP 325
AA4KT 325
K9IW 325
I5XIM 325
WA8DXA 325
W7OM 325
WØHZ 325
IK2ILH 325
W7CNL 325
W1WAI 325
N6AR 324
IT9VDQ 324
W8XD 324
K8LJG 324
K4CN 324
DL3DXX 324
4N7ZZ 324
DJ2PJ 324
WB5MTV 323
N5FG 323
W4OEL 323
W6SR 323
KUØS 322
K5UO 322
KA5TQF 321
ON4QX 321
K9QVB 321
HA5DA 321
KA7T 321
IT9ZGY 320
VE7CNE 320
K1HDO 320
I4LCK 320
K6CU 319
K2JF 319
HA5NK 319
N6AV 318
VE7DX 318
G3KMQ 317
N4CH 317
LA7JO 316
N4AH 315
NØFW 315
AA2X 314
WB4UBD 313
N1HN 313
K9DDO 312
K4JLD 312
W3II 312
K1VHS 311
WA8YTM 311
N6AW 311
N5HB 311
K7JS 311
OH3NM 310
OZ5UR 310
VE9RJ 309
9A2AJ 309
HB9DDZ 307
I2EOW 307
K8JJC 306
CT1YH 305
W7IIT 305
KE5PO 304
G2FFO 303
IKØADY 302
K1FK 302
W6YQ 301
N4OT 301
KH6CF 300
YV5ANT 299
KØHQW 299
YU1AB 294
G4MVA 294
W4UW 294
KB8O 292
F6HMJ 292
LU3DSI 292
DJ1YH 288
YU7FW 286
EA3BHK 282
YC2OK 280
PY4WS 276
KF8UN 276

SSB

K4MZU 330
K2TQC 330
K2FL 330
EA2IA 330
W6EUF 330
K2JLA 330
K6JG 330
K6GJ 330
N4MM 330
N4JF 330
VE1YX 329
K3UA 329
K1UO 329
K5TVC 329
W7FP 329
IK1GPG 328
LA7JO 328
DJ9ZB 327
K2ENT 327
OZ5EV 327
N7RO 327
K6YRA 327
W6BCQ 327
K5OVC 327
KZ2P 327
VE7DX 327
AA6BB 327
EA4DO 327
ZL3NS 327
SM6CST 327
W3GG 327
I4EAT 327
W4UNP 327
YU1AB 327
F9RM 327
PY4OY 327
OZ3SK 327
XE1L 327
4Z4DX 327
CX4HS 327
OE3WWB 327
W7OM 327
K4MQG 327
K7JS 327
DU9RG 327
W6DN 327
I4LCK 327
IT9TQH 327
IT9TGO 327
WD8MGQ 327
I1EEW 327
IØZV 327
VE3MR 327
DL9OH 327
ZL1AGO 327
SV1ADG 327
VE3XN 327
K9MM 327
K7LAY 327
VK4LC 327
DL8CM 327
NØFW 327
I8KCI 327
XE1VIC 327
PAØXPQ 327
KE4VU 327
W7BOK 327
OE2EGL 327
I1JQJ 327
4N7ZZ 327
K9BWQ 326
WØYDB 326
W4QB 326
VE3MRS 326
K8CSG 326
WB4UBD 326
W2FXA 326
IK8CNT 326
N4KG 326
K8PV 326
NC9T 326
N4CH 326
K5UO 326
W6SR 326
W9SS 325
WA4IUM 325
WB1DQC 325
XE1AE 325
KA3HXO 325
KF7SH 325
YV5AIP 325
K9IW 325
WA4JTI 325
YV1AJ 325
YV1KZ 325
W9OKL 325
9A2AA 325
DL6KG 325
KØKG 325
OK1MP 325
WB3CQN 325
I2QMU 325
KB4HU 325
KC4MJ 325
CX2CB 325
TI2CC 325
IKØIOL 325
YU1HA 325
W4NKI 325
KZ4V 325
VE3GMT 325
W4EEE 325
KE4VU 325
WA4WTG 325
WD8PUG 325
W2CC 325
VE2WY 325
AA4KT 325
PT2TF 325
KM2P 325
N5FW 325
K9HDZ 325
WA3HUP 325
YV1CLM 325
N6AW 325
ZP5JCY 325
WB3DNA 325
I2EOW 325
KE5PO 325
K4JLD 325
K1HDO 325
K9PP 325
YV5IVB 325
KD8IW 325
N6AR 324
W4UW 324
VE2PJ 324
I8LEL 324
IT9ZGY 324
K6LEB 324
IK1GPG 324
VE7WJ 324
AI8S 324
N5FG 324
AC7DX 324
KØHQW 324
K2JF 324
VE2GHZ 324
OE7SEL 324
KC8EU 323
VE4ACY 323
W2FGY 323
YV5CWO 323
I8KCI 323
VE4AT 323
KD5ZM 323
KA5TTC 323
KB2MY 323
EA3BKI 323
N2VW 323
K8YVI 322
K9HQM 322
KC5P 322
WW1N 322
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W8AXI 321
W5XQ 320
KA5TQF 320
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KS2I 320
W7ULC 320
W3AZD 320
WØULU 320
CT1EEB 320
OA4QV 320
OE6CLD 320
W5RUK 320
LU1JDL 320
KF8VW 320
G4ADD 320
I4WZK 320
I4SAT 320
EA3EQT 320
KØFP 320
KE3A 320
N4CSF 320
NI5D 320
W6SHY 320
N4HK 320
DL3DXX 320
ON5KL 319
WA4DAN 319
KI3L 319
XE1MD 319
KB1JU 319
PY2DBU 319
IØSGF 319
KF8UN 319
K9QVB 318
AA4AH 318
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I8IYW 318
WA8YTM 318
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KX5V 318
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ZL1BOQ 317
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N5HSF 316
KB1HC 316
K6RO 316
W6NW 315
KV2S 315
WA9RCQ 315
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K6BZ 315
K7TCL 315
I4CSP 315
N6RJY 315
NØAMI 314
WB8ZRV 314
OH5KL 313
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K9YY 313
W9IL 313
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WA2FKF 312
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EI6FR 311
YZ7AA 311
AE5DX 311
GM4XLU 311
KA5RNH 310
I2MQP 310
HA6NF 310
KF7RU 310
AB4IQ 310
W4WX 310
EA5RJ 309
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EA5KY 308
EA3CB 308
EA3BHK 307
N6AV 306
TI2TEB 306
VE3DLR 306
W3YEY 306
XE1MDX 305
DK5WQ 305
EA5OL 305
WB2AQC 305
VE3CKP 304
K6CF 304
KC4FW 304
WB2NQT 303
EA3CWK 303
EA3BT 303
YC2OK 303
KD4YT 302
CT1YH 302
N5QDE 302
RA2YA 301
W2LZX 301
N3RX 301
YT7TY 300
W5OXA 300
WB6GFJ 299
VE3CKP 299
YV4VN 299
LU3HBO 299
KJ9N 298
KB5WQ 295
YT1AT 294
IT9VDQ 293
KJ5LJ 293
TI2LTA 292
KQ4WD 292
K2EEK 291
W6WL 291
YB1RED 291
DJ2UU 291
4X6DK 291
WA3KKO 290
OE7KWT 290
N6CFQ 290
WZ3E 290
IK2PZG 289
VK3IR 289
KF7VC 288
OK1AWZ 287
IK2DUW 287
EA5GMB 287
TU2QW 286
NM5O 285
EA1AYN 285
VE7HAM 285
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KK4TR 283
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WN6J 281
CP2DL 281
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KN4RI 280
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VE2DRN 277
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K3LC 277
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VE2AJT 275
US1IDX 275
Z31JA 275

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NI4H 305
K3UA 295
I1JQJ 289
EA5FKI 284
YC2OK 280
W4QB 280
W4EEU 276
G4BWP 276
KE5PO 274

darkness, 08–1200Z. Thirty meters should open a couple of hours earlier and may be the best bet for a ZL9CI contact. There may also be a brief opening on 20 meters around 1400Z.

West coast DXers should have no problem working ZL9CI. The long period of mutual darkness 09–1400Z will provide band openings on 40 and 80 meters. On 30 meters, try 08–1600Z. On the higher bands, 20 should be open 06–1600Z while 17 meters offers a wide range of 04–1800Z. Of course, ZL9CI is not going to spend all this time working W6's, but west coast DXers should keep a keen ear for odd-hour activity.

The part of the world hardest to work from Campbell Island is Europe. Europe lies near the antipodes from Campbell, which means signals are weak. European DXers' best bet to work ZL9CI is on 20 meters during a brief period of mutual darkness just after sunset in Europe, and before sunrise in Campbell, around 14–1600Z. There may be a short opening on 40 or 80 meters around 1600Z. The long path may well be as useful as the short path. Look for ZL9CI on 20 or 30 meters around 0800Z and on 17 meters around 1000Z. Auckland and Campbell Islands rank 8th Most Wanted in Europe, and higher still in some individual countries. This means that stateside DXers should stand by as requested by the ZL9CI operator when they attempt to work the difficult openings to Europe.

The DXCC entity of Auckland and Campbell Islands is one of several dozen such entities that would not qualify for separate entity status under current DXCC rules. In fact, the island group marks an important turning point in the evolution of the DXCC "country" criteria.

In the late 1950s, as DXpedition fever began to spread rapidly, the DXCC Countries (as then known) list was growing, especially island groups sufficiently far from the parent country. There was considerable discussion among DXers and the Awards Committee at ARRL Headquarters about the minimum distance necessary between the parent country and an off-shore island group before the latter counts as a new country. For years, this decision had been based on a seat-of-the-pants approach. This island group was too close to count as a separate country, while

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that group was indeed far enough away to count. As DXers searched for possible new countries, they asked for more specific distance requirements. In April 1960 the Awards Committee published the results of its research, stating that any new country must be a minimum of 225 miles from the parent country. This distance has since evolved into the current 350 kilometer separation requirement.

At the same time that the Awards Committee (there was no DX Advisory Committee in those days) was reviewing previous decisions to refine the mileage requirement, they were also considering an application for separate DXCC country status for Auckland and Campbell islands. At first glance, the island groups meet both the "feels right" and the new fixed mileage requirements. Auckland and its associated islands lie about 260 miles from the southern tip of the South Island of New Zealand. Campbell lies another 150 miles farther away to the south.

There are several islands belonging to New Zealand that lie between the South Island and Auckland. Steward Island is south of the mainland of New Zealand. Fortunately, Auckland is 235 miles from the southern tip of Steward. This still meets the 225 mile limit. However, there is a group of small islands called the Snares between Steward and Auckland. Auckland is only about 160 miles from the Snares. Since the Snares are definitely part of New Zealand, Auckland is too close to New Zealand territory to count as a separate DXCC country. And Campbell is too close to Auckland to count as a separate country. If some DXer submitted an application for this DXCC entity today, it wouldn't qualify. Or would it? It certainly didn't meet the DXCC country criteria prior to the recent rewrite. However, under the new rules, the Snares would have to meet the new definition of an "island" to be considered as New Zealand territory. If the Snares were composed of rocks that didn't meet the new 100 meter size rule, then they wouldn't be considered under the 350 kilometer separate rule. The determining distance would be that between Auckland and Steward Island. This exceeds the new 350 kilometer distance requirement. Thus, if the Snares were small enough, they would "disappear" under the new DXCC entity rules, and Auckland and Campbell *would* be added to the list.

In any case, the Snares *do* meet the size rule, and thus Auckland and Campbell do not meet current DXCC entity criteria. They, and dozens of other entities, have been "grandfathered" onto the DXCC list and will remain so. The new DXCC rules specifically discuss grandfathered countries and state that they will not be removed from the current entity list because of changes in the entity criteria. Auckland and Campbell do retain a small

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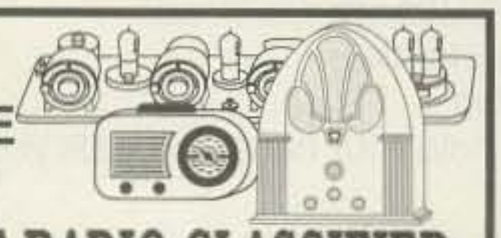
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footnote in the history of the DXCC program as being the last entity added to the list before specific mileage requirements were adopted.

This apparently subtle difference in the way intervening islands are considered in DXCC entity deliberations became a key argument in another potential New One for DXCC. In the early 1980s the Alaska DX Association (ADXA) petitioned to add the Pribilof Islands to the DXCC list. Part of their detailed analysis of other island groups on the DXCC list led them to believe that the then-225-mile separation rule should be measured from the "mainland" of the parent country, not from any offshore islands. Under this interpretation, the Aleutian islands would not bar the Pribilofs from the distance to the mainland of Alaska. The ADXA specifically mentions the case of Auckland and Campbell Islands, pointing out that the Snares were ignored or discounted in adding Auckland and Campbell to the list. To be consistent, the ADXA argued, the Pribilofs should also be added to the list. While this argument convinced a bare majority of the DX Advisory Committee, the decision to add the Pribilofs to the DXCC countries list was unanimously voted down by the Awards Committee comprised of ARRL headquarters employees. In what turned into one of the most divisive DXCC battles ever, the controversy concerning the Pribilofs raged for years. Ultimately, the Awards Committee decision prevailed, and the Pribilofs are not on the DXCC entity list.

Of the two island groups that comprise the DXCC entity of Auckland and Campbell Islands, Auckland is far larger, closer to New Zealand, and more frequently visited. Scientists and tourist boats regularly visit the main island in the Auckland group. Early visitors to the area attempted to found a permanent settlement on Auckland around 1850, but the project was abandoned after only a couple of years. During WW II, coast watchers kept tabs on enemy ships from Auckland, but the island group has been uninhabited since then.

Campbell Island, some 150 miles southeast of Auckland, consists of a single, 44-square-mile island. Its southern end is a mountain, with gentle slopes and harbors in the north. The climate is cold and very windy, but there is little snow, especially during the peak of the summer in the southern hemisphere. The permanent population of Campbell consists of seals and penguins, together with the occasional sheep left over from a ranching project that occurred early this century. The Rockhopper Penguin colony on Campbell is one of the largest such colonies in the world.

Campbell was discovered in 1810 by Frederick Hasselburg, captain of the *Perseverance*, which was owned by the Australian firm of Campbell and Company. As with most islands in the area, Campbell's greatest attraction after its discovery was its population of seals. Aggressive hunting quickly reduced the seal numbers below that justifying continued visits. Aside from an occasional whaler, Campbell was largely ignored until 1896, when sheep ranching was attempted. The sheep ranch lasted until 1931, the last time Campbell had a resident human population. Today, New Zealand maintains a weather station on the island. The ZL9CI team will make use of some of the weather-station buildings during their stay.

Most recent operations from Auckland and Campbell Islands have been by DXers piggy-backing on scientific or tourist trips. Ron Wright, ZL1AMO, together with Roly, ZL1BQD, and Wayne, ZLØAFZ, operated ZL9 in February 1988 with a scientific team. In March 1991 a five-person team operated as **ZL9DX, ZL9YL,** and **ZL2TPY.** They made about 10,000 contacts in what was the last major DXpedition to the entity. Graham Dawson, ZL4MV, managed about 1000 contacts

CQ DX Awards Program

SSB

2259	SV2CWY	2261	KC4FW
2260	SV1AER	2262	WB4OEE

CW

982	WC4K	984	JK1AKX
983	OK2BNC		

SSB Endorsements

320	K4MZU/330	320	W7FP/329
320	K2TQC/330	320	IK1GPG/328
320	K2FL/330	320	LA7JO/328
320	EA2IA/330	320	OE2EGL/327
320	W6EUF/330	320	KD8IW/325
320	K2JLA/330	320	OE7SEL/324
320	K6JG/330	300	KC4FW/304
320	K6GJ/330	300	W5OXA/300
320	N4MM/330	275	CP2DL/281
320	N4JF/330	275	SV2CWY/276
320	K1UO/329	28 MHz	WB4OEE
320	K5TVC/329		

CW Endorsements

320	K2TQC/330	320	EA2IA/329
320	K2FL/330	320	K2JLA/329
320	K6JG/330	320	W1WAI/325
320	K2OWE/330	320	DL3DXX/324
320	N4JF/330	310	LA7JO/316
320	K9BWQ/330	200	WC4K/210
320	K3UA/329	200	JK1AKX/208
320	N4MM/329		

RTTY Endorsements

275	W4EEU/280

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3D2JG to JA3JA
3W6US to N2OO
4L4KK to SV2AEL
4S7AHG to JA4AHV
4U1VIC to DL5IO
5B4/EW1AR to NP3D
5B4/NP3D to W3HNK
5H3US to WA8JOC
5J8IB to HK3DDD
5J9A to HJ3PXA
5N1ANE to N5DRV
5N9EAM to IK7JTF
5R8GC to DJ6SI
5U7DG to K4SE
5W1BV to KØBJ
5W1EA to KØCS
5X1DX to NY3Y
5Z4GC to WB2YQH
5Z4YN to KØBJ
6Y2A to WA4WTG
8P9HT to K4BAI
8P9Z to K4BAI
9A98JP to 9A7W
9A98PAX to 9A2TW
9J2WS to W4LF
9N1HA to N5VL
9Y4VU to NY3Y
A35ZL to DJ7RJ
A35ZZ to KØCS
A45XU to A92BE
AYØZ to pirate
B1A to KU9C
B4R to BY4RSA
BA4TB to BY4RSA
BQ9P to KU9C
C56A to DL5NAM
C56HP to JA1OEM
C56T to DL5NAM
C6A/KA6WHA to KI6T
C6A/WR6O to KI6T
C6AEP to WØCP
C6DX to WZ8D
CN2UN to ZP6CU
CO8JY to KU9C
CQ9K to CS3MAD
CS3GU to F6FNU
CT3GU to F6FNU
CU2V to DL4XS
CW4CC to CX2ABC
D68WU to F6HWU
DAØHQ to DL5AXX
DU2ABE to JA4DOB
DU4/GM4DKO to RSGB
DU6/K9AW to WF5T
E3ØHA to HA5YPP
E31DX to K4JDJ
EAØJC to CBA
EA2ADT to AG4T
EA9EA to EA9AZ
ET2A to F6HIZ
FK8HC to CBA
FOØQA to KØCS
FP4EK to K1RH
FP5EK to K1RH
FR5ZU/G to VE2NW
FS7/FMØAMF to K2KGB
GM8V to ZS5BBO
GT3FLH to GDØTEP
GUØLYQ to AA6MV
H2ØA to 9A2AJ
H73C to HR1RMG
HBØ/HA5RT/P to HA6NL
HI8/DK8YY to DL4JAN
HL9BK to K2KSY
HO3A to HP3XUG
HR6/WP3A to W4DN
HSØAC to HSØ/G3NOM
J48ISL to SV2AEL
J67AH to K2IGW
J6LBH to K2IGW
J79LI to AA6MV
J79MV to AA6MV
JT1FCP to W8JAY
JW9XGA to LA9XGA
KH6/AA6MV to AA6MV
KH6HEI to W9WU
KR6NR to W9WU
KZ5BU to KØBJ
LRØH to LU9HS
LX1JAV to LX2AJ
LX9KGS to LX2AJ
LX9LGS to LX2AJ
LZ1JAV to LX2AJ
N98ITU to WØAIH
OHØAW to OH1EH
OH1AF to OH1XT
OK8PDX to AI5P
OM9AIP to AI5P
P4ØW to N2MM
PTØF to N5FA
S92A to NJ2D
SN2ØJP to SP9PKZ
SN4JP to SP6GFG
SUØERA to WA3HUP
SUØERA/8 to WA3HUP
SU1ER to WA3HUP
SU1JOTA to WA3HUP
SU1MR to WA3HUP
SU1RR to WA3HUP
SU1SR to WA3HUP
SU2MT to CBA
SU8LXR to WA3HUP
SVØFE to KØTLM
SVØSS to WA3HUP
T24JA to JA3JA
T2DX to W4WET
T3ØCT to DL1VU
T31AF to DL1VU
T32BI to KH6DFW
T32IW to DJ5IW
T32LI to AA6MV
T32MV to AA6MV
T32VU to DL1VU
T33VU to DL1VU
T88X to JA6VZB
T94MV to F6HIZ
TAØS to DL6DB
TE4A to W9WU
TJ1PD to N5DRV
TJ2RSF to EA4URE
TM5CW to F5SJB
TN7OT to AL7OT
UE6YUS to KD6GC
V26AK to N2TK
V26R to KA2AEV
V63HC to KQ1F
V63HO to WA1S
V63YP to K1XM
V8A to JH7FQK
VJØARY to JA3JA
VKØXX to pirate
VK2BJZ to KØBJ
VK3AKK to K1UO
VK9CQR to HB9TL
VK9CTL to HB9TL
VK9XQR to HB9QR
VK9XTL to HB9QR
VP2MCO to AA6MV
VP2MCP to AA6MV
VP9/US5I to N5FG
VR2SS to JK2PNY
VR6BJ to KØBJ
VS6WB to KØTLM
VS6WV to KØTLM
WØYZS to KØTLM
WHØV to WHØAAV
WP3R to W3HNK
XE1FES to W3HNK
XR3J to HB9AOF
XR3M to W3HC
XT2HP to JA1OEM
XT2JF to N5DRV
XT2JT to N5DRV
XT2LT to N5DRV
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XT2RT to N5DRV

(Continued on page 78)

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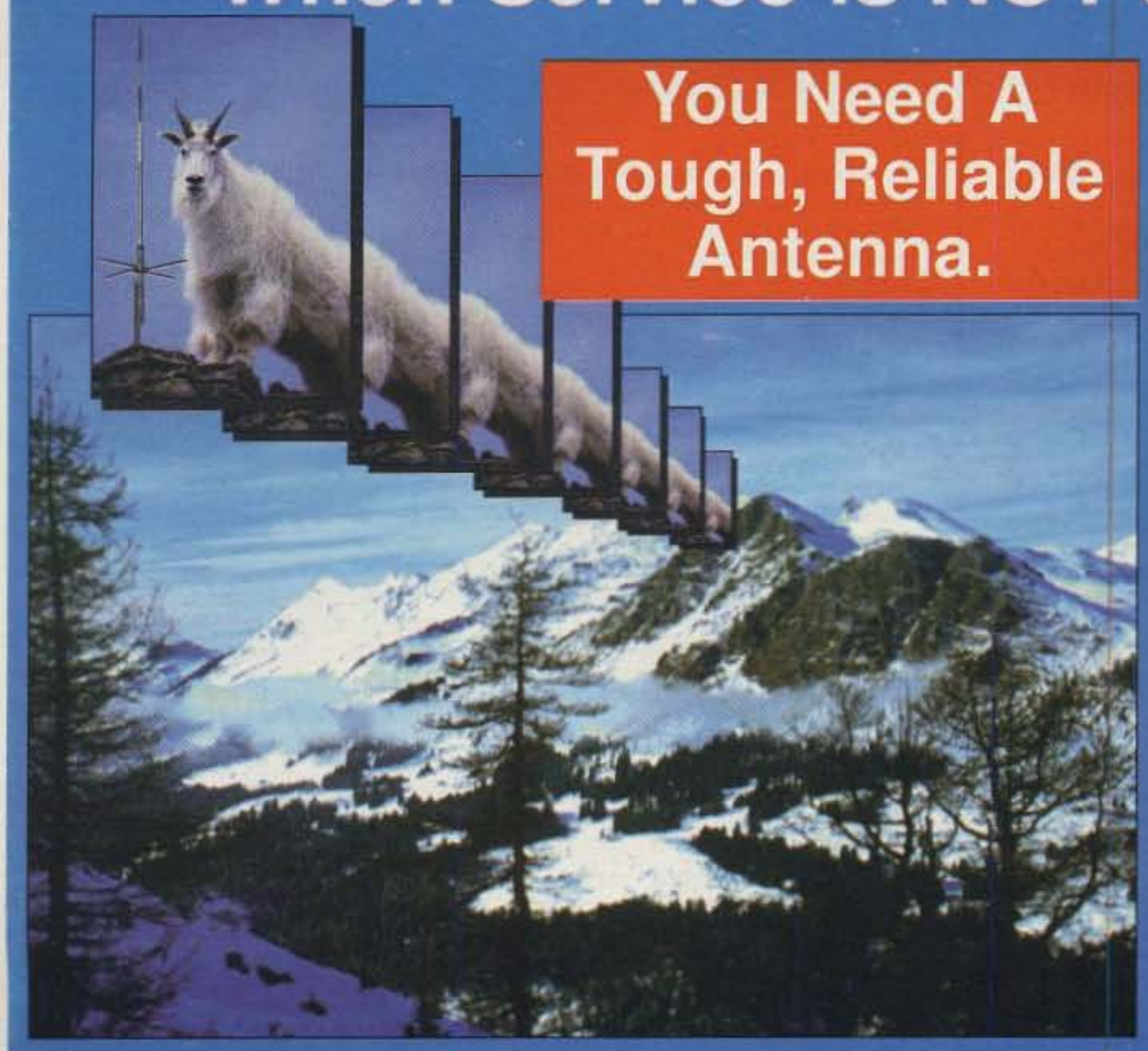

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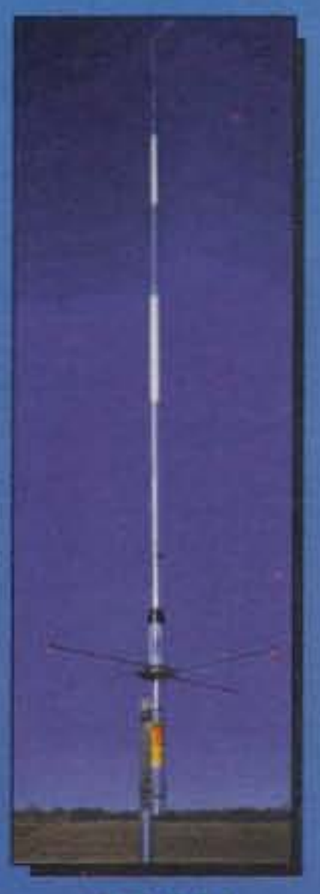

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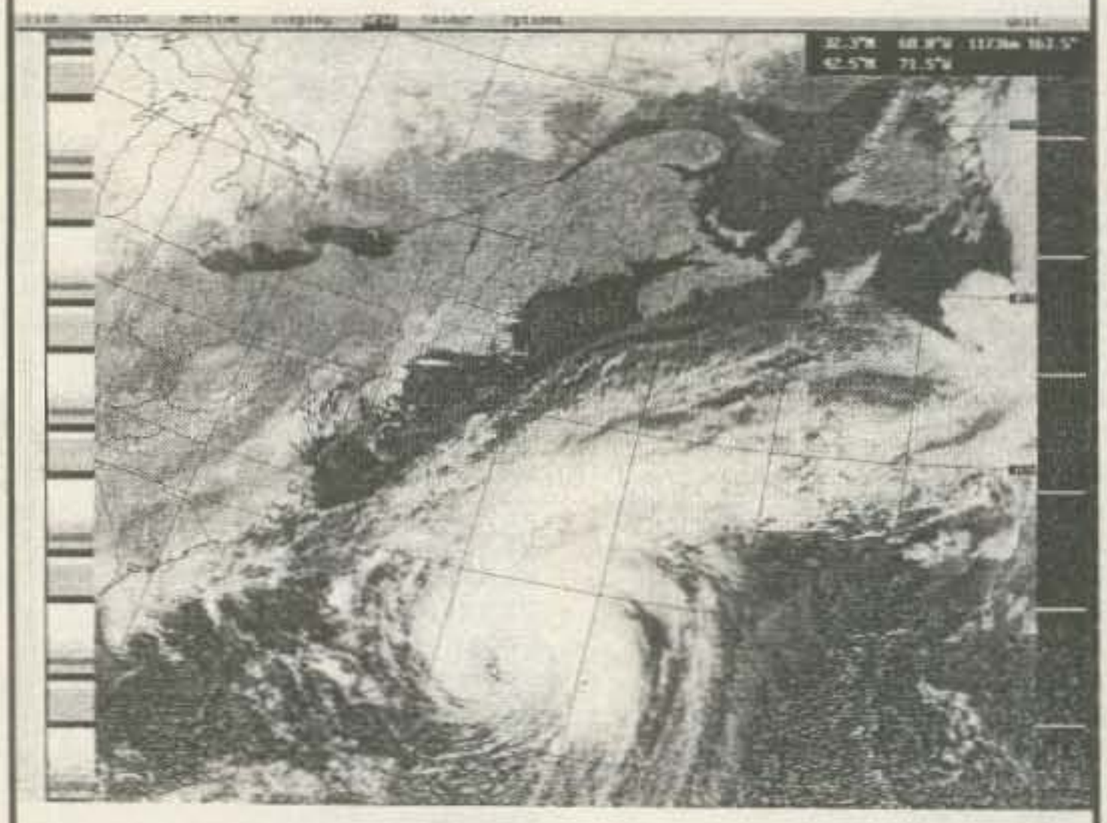

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3W6LI to Trinh Hau, P.O. Box 076, Sai Gon Central Post Office, Ho Chih Minh City, Vietnam
5B4/RU3AA to Konstantin K. Khatchaturov, P.O. Box 1, Moscow 117588, Russia
5B4/UA2FB to Dmitri Gorshkov, P.O. Box 72, Kaliningrad 236000, Russia
6K5RFO to Young Ha Kim, #589-5, Shinmae-dong, Susung-gu, Taegu 706-170, Korea
7P8AL to Mike Shutts, P.O. Box 1459, Maseru 100, Lesotho
9H3AY to Jeff Bottom, 48 Chesterton Avenue, Harpenden, Herts. AL5 5SU, England
9M2IY to I. Yoshioka, Kamaya Electric (M) S/B, Plot 9, Kinta FTZ, Jln. Kuala Kangsar, 31200 Chemor, Perak, Malaysia
9N1FP to Vladimir Zakharov, Kulakova 27/2 - 116, Stavropol 355044, Russia
BD4EG to Zheng Feng, P.O. Box 122-001, Shanghai 200122, China
BD4ER to Kent, P.O. Box 122-001, Shanghai 200122, China
BD7BF to Ro, 249 Yanfeng Road, Hengyang, Hunan 421001, China
BG5WJC to Cao Jian-Jun, P.O. Box 321, Qingliu, Fujian 365300, China
BI4Q to Jiang Su DX Club, P.O. Box 538, Nanjing 210005, China
BMØS to P.O. Box 2006, Taichung, Taiwan
BV2/N2IT to Louis Dvorsky, 169 Min-Sheng E. Road, Sec. 5, 10-2 F, Taipei, Taiwan
C6AFV to P.O. Box F-42642, Freeport, Grand Bahama, Bahamas
DS1GQS to Pilman Kim, #501-1209 Chamsil APT 27, Chamsil-dong, Songpa-Ku, Seoul 138-225, Korea
DS2AXU to Sang Yong Yun, P.O. Box 80, Pyong Taek 450-600, Korea
DS2KKM to Kim Chul-Jin, P.O. Box 340, Nam-Inchon P.O., Nam-Dong-Gu, Inchon, Korea
DS4NKA to Lee Hi Mun, Samik APT 605, Samchun Dong 1 Ga, Wansan Gu, Chonju, Chonbuk 560-291, Korea
DS4NKB to Lee Mi Ho, Samik APT 605, Samchun Dong 1 Ga, Wansan Gu, Chonju, Chonbuk 560-291, Korea
DS4NKC to Lee Sung No, Samik APT 605, Samchun Dong 1 Ga, Wansan Gu, Chonju, Chonbuk 560-291, Korea
DS4NMZ to Lee Young No, Samik APT 605, Samchun Dong 1 Ga, Wansan Gu, Chonju, Chonbuk 560-291, Korea
DS5SME to Shin Sang Jae, P.O. Box 21, Dalseogu 704-600, Korea
DS5TXN to Kim Dae Sik, 301, Jogyo-Dong, Youngchun, Kyungbuk 770-120, Korea
DS5WSA to Jong Jik Jeong, P.O. Box 4, Ponghwa 755-800, Korea
DU1ELT to Tasmi G. Datumanong, CPO Box 2167, Quezon City 1161, Philippines
DU1LER to Jose S. Torres, Jr., P.O. Box 460 QP, Cainta, Rizal 1900, Philippines
ET3AA to Ethiopian Amateur Radio Society, P.O. Box 60258, Addis Ababa, Ethiopia
HL1MSE to In Kol Yu, Shibum APT 16-23, 50, Yoido-Dong, Youngdeungpo-ku, Seoul 150-010, Korea
HL1MSF to Woo Jeong Nam, Shibum APT 16-23, 50, Yoido-Dong, Youngdeungpo-ku, Seoul 150-010, Korea
HL2DBP to Jeong Eui Gang, P.O. Box 48, Kangnung 210-600, Korea
HL2IGU to Ahn Kwang Phil, 526-2 Gan Seok Dong, Nam Dong Gu, Inchon 405-230, Korea
HL5AEX to Bak, P.O. Box 97, Kyongju 780-600, Korea
HL5FOP to Ray, P.O. Box 97, Kyongju 780-600, Korea
HS1AQX to Samattachai Chirapiriyakul, P.O. Box 97, Lampang 52000, Thailand
HS1OVH to Malinee Chantrasmi, P.O. Box 195, Samsennai, Bangkok 10400, Thailand
HS6NDK to Sonthaya Phanthanyakit, 201/1 M. 3 Nakhon Derd, Srinakorn District, Sukhothai 64180, Thailand
PZ1DR to R. Dawson, M.D., P.O. Box 396, Paramaribo, Suriname
SV1EEN to Alex Manouropoulos, 31 Zodohou Pigis Str., GR-162 33 Vironas, Greece
TA2D to Ahmet Kaynak, P.O. Box 27, Kdz. Eregli, Turkey
V51AE to Andre Esterhuyse, P.O. Box 85, Koes 9000, Namibia
VP6TC to Tom Christian, P.O. Box 1, Pitcairn Island
VR2PM to Koo Sze-Kwong, P.O. Box 84445, Hung Hom Bay Post Office, Hong Kong, China
VU3PMU to P. M. Joshi, 49, Durga Nagar, Old Padra Road, Baroda 390 020, India
YB2EMK to Arnold A. Pandelaki, Singosari III/14, Semarang 50241, Indonesia
YB4FIK to Chairul M. Saad, Jl. Mat Yasin No. 16, Tanjung Pandan, Belitung 33416, Indonesia
YCØGJS to Gjellani Joostman Sutama, P.O. Box 6122 JKPMT, Jakarta 10310, Indonesia
YC4DAK to Hasan Iskandar, Jl. Sri Soedewi No. 40, Telanaipura, Jambi 36122, Indonesia
YC5TML to Erizal M. Isa, P.O. Box 154, Batam Island 29400, Indonesia
YC5YCT to Usman Ma, P.O. Box 154, Batam Island, Indonesia
YC8NLF to Yohana E. George, P.O. Box 1068, Palu 94001, Indonesia
YC9BAS to Nyoman Dodi Irianto, SPd, P.O. Box 250, Singaraja 81100, Indonesia

The table of QSL managers is courtesy of John Shelton, K1XN, editor of The GOLIST, P.O. Box 3071, Paris, TN 38242 (phone 901-641-0109; e-mail: <golist@wk.net>).

from Auckland as **ZL9GD** while working with a film crew.

The ZL9CI promises to be DXers' best shot at a ZL9 contact for some time. New Zealand is cracking down on human visitations to its remote islands to preserve what is left of the ecology after the seal hunters and sheep ranchers finished their business. The New Zealand Department of Conservation is greatly restricting access to Campbell, so don't wait for the next operation.

More info is available at the ZL9CI website: <http://www.qsl.net/zl9ci/>. You can even check the weather on Campbell at the website! Good hunting!

DX News and Events

Nepal, which once had but a single licensed amateur (9N1MM), has progressed to the point of issuing geographically based callsigns. Native Nepalese stations will use 9N1–5, depending on location, while visitors will use the 9N7 prefix. For example, Jack, W4SON, operated from Nepal in November under the call of **9N7SON**. QSL via W4SON.

Hideyuki Kai, JM1LJS, will be active as **VK9CL** from Cocos-Keeling Island (OC-003) December 26 to January 2 on 80–10 meters, CW, SSB, RTTY. He will be running a 400 watt amplifier into a simple wire or vertical antenna. QSL to Hide's home address: 4-22-15 Takata-Higashi, Kohoku-ku, Yokohama City 223-0063, Japan.

RADIO WORKS

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CAROLINA BEAM 80,	80-10m,100' long.Powerful	$105.95
CAROLINA WINDOM 160,	160 -10m, 252' Big Bang	$119.95
BigSig 40,	3/2 wave loop, 40 m, 110' A Sizzler	$69.00
G5RV Plus,	80-10m, 102'+ High Power Current Balun	$57.95

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B1-5K	1:1	5 KW	160 -10 m	Precision	$31.95
B1-1KV	1:1	1 KW	15 - 2 m	VHF Current Balun	$25.95
Y1-5K	1:1	5 KW	160 -10 m	The YagiBalun™	$33.95
B4-1KXV	4:1	1 KW	15 - 2 m	VHF Current Balun	$29.95
B4-2KX	4:1	2 KW	160-10 m	4:1 Current Balun	$42.95
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New! VHF Baluns
B1-1KV 1:1 and B4-1KXV 4:1
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T-4G	Identical to T-4G without direct grounding	$33.95
T-6	VHF version of T-4 15 - 2 meters, 1 KW	$25.95
4K-LI	Line Isolator, SO-239 in and out	$21.95

January Specials

PL-259	Silver & Teflon	$1
RG-8X	Premium, 95%	13¢
RG-213	Mil-type, 95%+	33¢

Antenna Wire and Parts

PL-259ST	Silver-Teflon, USA	SALE $1.00
PL-259GT	Gold-Teflon, USA	$1.49 or $30/pk of 25
N/9913	For 9913, 9086, Flexi, etc.	$3.25
N/9913S	As above but Silver & Teflon	$4.25
N-200	'N' Silver-Teflon, installs like PL-259	$3.00
	Coax & Cable Prices	<100'/100'+
RG-8X	Premium grade, 95% braid, SALE	19¢/13¢
RG-8X Plus	95% shield, type IIA non-contaminating	26¢/22¢
RG-213 Plus	Enhanced, 96%+ super jacket	45¢/38¢
RG-213	Top Quality, 95% (Sale on 100' or more)	33¢
ExtraFlex	Flexible, 9913 type	57¢
R1 Rotator	8 conductor (2 x #18, 6 x #24) SALE	26¢/20¢
R2 Rotator	8 conductor (2 x #16, 6 x #18) SALE	47¢/35¢
#14 HD	Stranded, 7 x 22 hard-drawn	8¢
#14 FlexWeave™	168-strand, bare for any wire ant.	14¢
#12 FlexWeave™	259-strand, excellent for longer runs	19¢
450 Ladder	#16 stranded cond, windows SALE	22¢/16¢
450 Ladder	New! #14 stranded cond, poly SALE	30¢/24¢
1/2" Braid	Tinned copper, for ground systems	65¢

Pulleys - for antenna support rope. Highest quality, small, lightweight sailboat type for fibrous rope - for 3/16" rope $11.95 or 5/16" rope $14.95

Antenna Support Line MilSpec Dacron, single braid, solid, fungus & sun resistant line. 3/16" 700# test 100' hanks $8
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CIRCLE 36 ON READER SERVICE CARD

The EN8IL team from Liapin Island.

Another Japanese DXer on the DXpedition trail at the New Year is Den, JI1FLB. Look for Den /**JD1** from Ogasawara (AS-031) December 30 to January 2. He'll be on the amateur satellites and 6 meters as well as on the HF bands. QSL via home address: Seiichi Tanaka, JI1FLB, 2-12-20 Nishimizumoto Katsushika-ku, Tokyo 125-0031, Japan.

Joe, W8GEX, will wrap up a multi-country trip to the Caribbean with a stop in the Turks and Caicos Islands January 1–9. Look for him operating as **VP5/W8GEX**.

Lee Fuller, GØULN, will operate as **8Q7LE** from the Maldives December 22 to January 13 SSB only on the Islands On The Air (IOTA) frequencies of 3755, 7055, 14260, 18128, 21260, 24950, and 28460 kHz. QSL home call, direct or via the RSGB (England) bureau.

Sunspot Cycle 23 has been advancing as predicted. The Space Environment Center continues to predict a peak in the first half of the year 2000, at a level comparable to that of the past two cycles. The higher bands are already open much of the time, so DXers should expect good conditions for the next few years.

The DX Internet reflector managed by the NJDXA (see the November issue) has a new address. To subscribe or for more information, contact the club at <http://njDXa.org/DX-news>. DX news may be posted to <DX-news@jerseycape.net>.

Another new Internet DX feature is a searchable database of older issues of "The Daily DX." ("The Daily DX" is a daily electronic DX newsletter and provides much of the DXpedition information for this column.) With the database, a DXer can look up QSL routes or information about previous DXpeditions. The file goes back to March 1997. At this time, the database is available to all comers, but it may be restricted in the future to subscribers to "The Daily DX." Look for the database at the home page of "The Daily DX": <http://www.dailyDX.com>. Note that current DX information is *not* included in this database. For more information on "The Daily DX," see the above home page or call editor Bernie McClenny, W3UR, at 301-854-5650.

Don't forget that US postage rates increase on January 10. The rate for the first ounce will be $0.33. The USPS is already selling the "H" hat stamps that represent the new rate. DXers can also obtain a non-denominated stamp representing $0.01, to be added to the older $0.32 stamps to bring the postage up to the new rate. Note that neither the H stamp nor the weathervane $0.01 stamp can be used outside the US. Only stamps bearing a numerical denomination may be used for overseas mail, including mail to Canada and Mexico. This means DXers may have to get a little creative to send mail outside the US. International postage rates may increase later this year.

QSL News

QSL Oleg Foryakin, UA3AFS, via the following new address: Box 90, Moscow 103062, Russia.

Mike, KHØAS, has a new QSL manager: Jim Sladek, WB4UBD. He has logs and previous QSL requests, except for those sent via the KHØ bureau, of which there isn't one.

Bob Fox, NM2D, is now active as **V31MD** from Belize. QSL direct to him at P.O. Box 528, Belize City, Belize, Central America. Old addresses through his previous stateside calls are no longer valid.

QSL **VE3FU/NP2** and **VO2CQ** via the following new address: Chris Allingham, VE3FU, 19 Westcliffe Road, Nepean ON, Canada K2H 7X3, or via the RAC (Canada) bureau.

QSL the multi-op contest station of **ZP9X** via Carlos Alberto Biasone, ZP9XB, P.O. Box 282, CP 7000, Ciudade Del Este, Paraguay.

73, Chod, VP2ML

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AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

Following is an account of the amateur radio activities of Sanford K. Smith, N7PIB, of Vineburg, California. As of this writing, he has been on the road since early September putting out counties and even activating an island in Wyoming.

"I came by county hunting naturally, as I was born in Daggett County, Utah, just 100 yards from the county/state line of Daggett, Utah, and Sweetwater, Wyoming. I went to a schoolhouse that was located on that state line with the result that we had two separate three-person school boards, one for each state, and this for a school with only two dozen students. In college I got a commercial license while I worked with my college radiom station as a "techie" and classical DJ. I was an avid SWL in my spare time.

"My reincarnation as a ham came in 1991 as the result of a fortnight-long visit to Pitcairn Island during the 200th anniversary of the landing of the *Bounty*. My original interest in amateur radio was as an aspect of search and rescue work in the Rockies. I was raised before we had electricity or a telephone at home. The radio was quite literally our only connection to a world in which the nearest town of any size was two days away. Even the advent of cellular telephones has not helped much in geography in which 70 percent of the state is not able to use cellular telephones.

"While DX was my earlier interest as a strictly recreational aspect of amateur radio, I became involved with county hunting as a result of an island expedition to nantucket Island, my sister's home. I had been pushed off 14.260 and was blithely giving out IOTA NA-46 on 14.339, when a YL mentioned that I was operating from a rare county, and wouldn't I like to put it out on the county hunters' net at 14.336. I did so, and simply had a larger than normal pile-up. That probably would not have changed my life except that I later met up with W6NNV, Norm Wasson, in Arcadia, California. While we had tea together, he was acting as the net controller for the CW county hunters' net, and he piqued my interest.

"When I returned home to Wyoming, I talked with WA7IRD, Willie Mintzer, then living in Baker, Oregon. She encouraged me to start giving out counties as I did my weekly commute from Jackson, where I lived, to Rock Springs, where I worked, crossing Sublette county every Friday and Sunday evening. That and frequent trips to Daggett county, where I still maintain the original homestead, gave many county hunters access to two very uncommon counties.

"As the DXing disappeared from the high bands, I turned to county hunting, especially as I drove 3,000 to 4,000 miles each month and covered all of Wyoming, eastern Idaho, and northeastern Utah. Starting with about 750 counties confirmed from casual contacts by 1994, I found myself down to only several dozen to go by the spring of 1998. The states that gave me the most difficulty were Georgia and Kentucky. Despite the vast reams of paperwork to confirm all 3076, I found it a very enjoyable experience. I went to my first convention last July in San Antonio and hope to make future conventions.

"Altogether I made over 15,000 QSOs with over 1,000 American hams in order to reach my goal, about half having been made while I was mobile myself. I have put out nearly 500 counties and hope to greatly expand that number with future trips.

"After having tried to adapt a base station to mobile operation, I finally settled for a Kenwood TS-50S with antenna tuner, running barefoot to an Outbacker. My Outbacker is mounted on the roof of a Previa van aand has helped me to get the equivalent of DXCC mobile as well as WAS mobile-to-mobile. Along with the comfort of knowing that I can contact others no matter where I am, I have been able to use my gear to report avalanches blocking roads, landslides, vehicles swept into rivers, vehicle fires, grass fires, traffic accidents, and even bears breaking into vehicles! Even as DX begins to improve again, I will continue to monitor the CH nets, as they serve a very important function for those of us who have lived most of our lives in very remote areas."—*N7PIB*

65 Glebe Road, Spofford, NH 03462-4411
e-mail: k1bv@top.monad.net

USA-CA Special Honor Roll

Lloyd S. Smith, NX4W (N1OAZ)
USA-CA All Counties #958
October 15, 1998

Chuck Imsande, W6YLJ
USA-CA All Counties #959
October 20, 1998

USA-CA Honor Roll

500
AD1B.....3044
SV2ASP/A.....3045

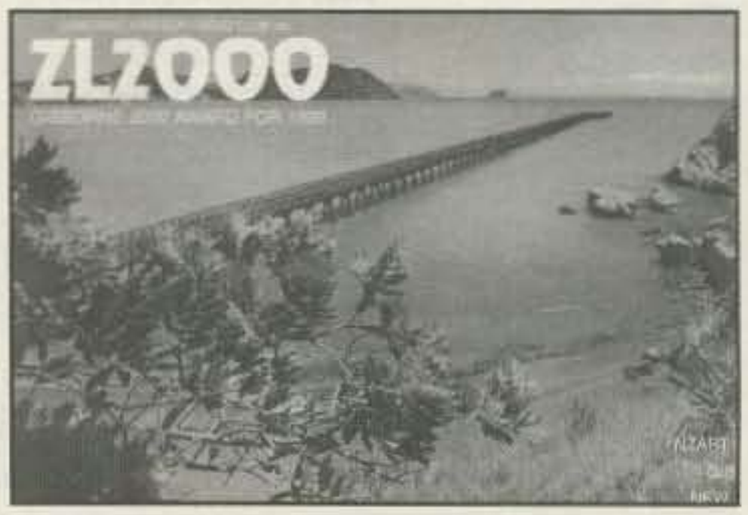
1000
AD1B.....1493
K1BV.....1494

1500
KD9ZP.....1242

3000
NX4W.....977

Special Note: SV2ASP/A is Monk Apollo, who operates from one of the rarest DXCC countries in the world, Mount Athos, a Greek monastery.

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from *CQ* Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.



The Gisborne ARC ZL2000 award for the year 1999.

Gisborne 2000 Award

This is the newest Gisborne 2000 award, the fourth in a series of five awards leading up to the turn of the century. This year's subject is the Tologa Bay Wharf, dating back to the turn of the century, and used for loading and unloading cargo from sailing ships in the early days. It is now under restoration by a Gisborne group. Next year is the big award.

Gisborne is unique, being the first city in the world to observe sunrise on a new day each year. It will be the center of much attention during the New Year period of the millenium in the year 2000. Make one contact with special station ZL2OOO during the month of January each year starting in 1996 and ending with 2000. All bands, phone or CW. A different multicolored pictorial award will be issued each year. SWL okay. Any person having earned four of the awards, including the one during the year 2000, will be issued a very special award. Send GCR list, a

Say You Saw It In CQ

copy of your QSL, and a fee of A$5 or US$10 to: Gisborne 2000 Award, P.O. Box 1017, Gisborne 3801, New Zealand.

More New Zealand Awards

The NZART Awards Custodian, Alan Chapman, ZL3GX, was kind enough to send samples of most of the NZ awards issued by that organization. These are well-designed, colorful, and certainly well worth applying for.

General Requirements: Applicants do not have to possess the cards, but they must certify on the application that the contacts were legitimately made. Endorsements for special band or mode are available on request. Application forms are available for most awards from the sponsor (or K1BV) for an SASE or IRC. Cost for DX applicants is US$2 each except WAP (US$3) and 5X5 (US$5). If airmail is requested, please add US$2. Applications should be sent to: NZART Awards Manager, P.O. Box 1733, Christchurch 8015, New Zealand.

The Captain James Cook honors the memory of this famous navigator and seaman.

Captain James Cook Award. This award perpetuates the memory of this world-famous navigator and seaman by requiring contacts in countries he visited in the 1700s. Three classes are available, progressing from easy to challenging. The basic Sailor Class requires contacts with G – Yorkshire, FO8, ZL2, VK2, KH6. Officers Class requires all the contacts of the Sailor Class plus ZL1, ZL3, ZL4, VK3, VK4, New Guinea, and any Antarctic station. Command Class requires all the contacts for Sailor and Officer Classes plus any five of the following: VE2, VO, A35, YJ8, FK8, CE8, and KL7.

IARU Region III Operating Award. The purpose of the award is to encourage contacts with Region III. It is available to all amateurs and SWLs for such contacts on or after April 5, 1982. The eligible countries are those in Region III whose societies are members of the IARU Region III Association. These are: Australia, Bangladesh, Brunei, China (PRC), Fiji, French

The IARU Region III Award encourages contacts with Region III.

Polynesia (FO8 only), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Pakistan, Papua New Guinea, Philippines, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, and Vanuatu. Plus one country credit from US Territories in the Pacific from Guam, Northern Marianas, American Samoa, Wake Island, Baker-Howland Group, as presented by ARRL. One country credit from Pitcairn Island (VR6), Chagos Archipeligo (VQ9), represented by RSGB. The current total of available "countries" is 28. Requirements for award as of January 1, 1986: Basic 7 areas; Silver endorsement 15 areas; Gold endorsement 20 areas. These are to be reviewed as considered necessary by the custodian, who recommends action to the Secretariat.

The New Zealand Award is available only for stations outside New Zealand.

New Zealand Award (NZA). This award is available only for stations outside of New Zealand. Contact: 35 ZL1, 35 ZL2, 20 ZL3, 10 ZL4, plus 1 contact with ZL "territory" either from NZ Antarctic, Chatham Island, Kermadec Island, or Campbell Island. This one contact requirement may be satisfied by 20 ordinary ZL contacts if desired. This makes a total of 101 contacts which must date on or after December 8, 1945.

ENZART Award. This award honors NZART by requiring contacts with ZL members of the national organization. The basic award requires 200 points with endorsements for 250, 300, and 350

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points. The Honor Award Level requires 400 points with further endorsements for each additional 50. There is an Honor Plaque for 500 points.

Points are earned as follows by contacting an NZART member who is on the voting roll of the local branch: Phone = 1, CW = 2, Club station QSO = 2, YL Operator = 1, VHF/UHF = 1, Mobile QSO = 1, AMSAT QSO = 1, Branch President QSO = 1. Valid contacts must be with active members. Contacts claimed with a branch station must be from a clubroom or other permanent headquarters, or during a contest, from an exhibition or other organized activity. Contacts with mobiles are eligible only when the mobile station is within 50 km of the branch clubroom or the operator's own QTH.

A station may be claimed in several categories. For example, the Branch President may be claimed for both phone and CW, as well as for Branch President, but *each* claimed must be for a separate contact, and the contacts must be not less than 24 hours apart. No cross-mode contacts. Club "net" contacts are not eligible until the net concludes. ZL applicants must be members of NZART, and all applicants must certify that each contact made fulfills award requirements. Contacts must have been made on or after November 1, 1976.

The ENZART requires contacts with ZL members of the national organization.

The ZLA Award also offered by the NZART.

ZLA Award. Make one contact each with Auckland City, Wellington City, Christchurch City, Dunedin City, Antarctica (ZL5), Campbell Island, Chatham Island, and Kermadec Island.

URL of the Month

My own site is a subdirectory on Monad-Net of Keene, New Hampshire. Like many ISP's, they provide subscribers with disk space for free, and I've used them to host my web page, which is located at: <http://top.monad.net/~k1bv>. It's not really fancy. You won't find any Java excited whirling globes or blinking text. Instead, I've provided links to about 25 different sites which present interesting award rules and images plus complete rules to "short time awards." These are awards which are valid only during the present year and aren't permanent. So the next time you hear a DX station with an odd prefix which sounds like an anniversary (LY70XX, OEM1XXX, or LU25XX), you can check and see if there's an award associated with working some of them. The site changes whenever new information is uncovered. You are welcome to come in and see what's new.

And by the way, I'm still waiting for you to send in a sample of your club or group's award certificate.

73, Ted, K1BV

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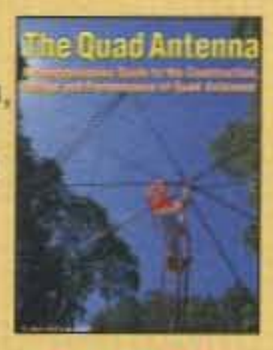

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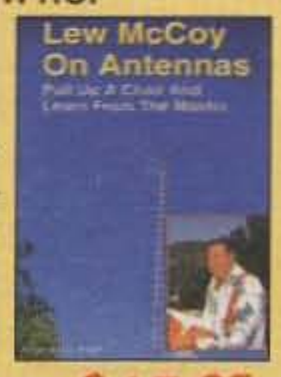

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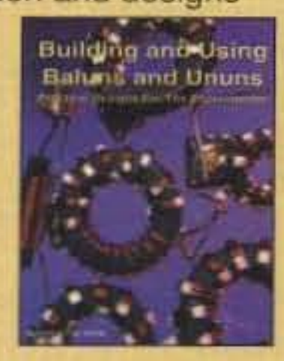

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BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

Comments Pouring in on Amateur Radio Restructuring!

Is Morse code needed? And if so, at what proficiency speeds? Amateurs are telling the FCC!

The hot subject in amateur radio continues to be the FCC's proposal to restructure the Amateur Service. On August 10, the Federal Communications Commission released a lengthy Notice of Proposed Rulemaking which looked toward remodeling the Amateur Service. The proceeding is part of the FCC's 1998 Biennial Review of regulations which no longer serve the public interest.

In the NPRM the Commission proposed to reduce the number of amateur license classes from six to four, permit the Advanced Class to Act as Volunteer Examiners for the General Class, and eliminate RACES (Radio Amateur Civil Emergency Service) licenses. They also asked for input on ideas to improve the Amateur Service enforcement process and possible changes to the Morse code and written examination requirements.

The FCC proposed four license classes (Technician, General, Advanced, and Extra Class) with which, in a July 22nd letter to the Commission, the American Radio Relay League agreed. The ARRL initially wanted the classes called A, B, C, and D, however. The League later (on October 24th) reverted back to Technician, General, Advanced, and Extra.

Keep in mind that the ARRL proposal to the FCC was made three weeks before the FCC released their restructuring version. The League further proposed that the code speeds should be reduced to 5 wpm for the General and 12 wpm for the Advanced and amateur Extra Classes, down from 13 and 20 wpm.

Like the FCC, the ARRL suggested that the Novice and Tech Plus Classes be abolished, with the General Class becoming the HF entry. The NPRM had a comment filing date of December 1st, with reply comments by January 15th.

In their 35-page comments to the FCC, the Volunteer Examiner Coordinators suggested that the proper number of Amateur Service classes should be three: Technician (no code), General (5 wpm), and Extra Class (also 5 wpm).

So there were three major proposals on the table, that of the:

FCC: Four license classes, but no change in the Morse requirements. The 5 wpm examination would remain, however, and Technician Class operators who passed it would be able to use what were the Novice bands. The General Class would require 13 wpm, while the Extra Class would require 20 wpm.

ARRL: Four license classes, with General requiring 5 wpm and Advanced/Extra 12 wpm. At their October 24th board meeting, ARRL directors further agreed that Technician Class operators should be permitted to operate CW in the General Class band without prior testing. This was more or less a bombshell position, since no other country in the world permits high-frequency CW operation without prior examination. The ARRL's rationale was that if a person could carry on a CW QSO, then the international requirement of proving Morse proficiency in order to operate below 30 MHz had been met. The ARRL suggested 35-question written exams for the Technician and General Classes, 40 for Advanced, and 50 for Extra.

VEC: Three license classes—Technician, General, and Extra Class. A top speed of 5 wpm also would mean that VEs no longer would face the problems associated with issuing waivers of the higher code speeds to the handicapped. The Advanced Class would be combined with amateur Extra. The VECs proposed 50-question written exams for the Technician and General Classes and 100 for Extra.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443
e-mail <fmaia@cwixmail.com>)

Comments from the Amateur Community

Comments started pouring into the FCC almost immediately! At this writing, close to 600 have been filed and posted to the Commission's Electronic Comment Filing System (ECDS). We have been keeping track of the comments on the Morse code issue (which is by far the most contentious issue), and the results are predictable.

1. Most Extra Class amateurs oppose any change in the code requirements, since they have already passed 20 wpm.

2. Most General and Advanced Class amateurs favor the ARRL plan, which proposes a maximum 12 wpm code speed. (They have already passed 13 wpm.)

3. Tech Plus and Technician licensed amateurs overwhelmingly favor the VEC proposal which provides for a maximum 5 wpm code speed.

4. In total, most amateurs favor the VEC proposal.

5. Very few Novice operators are filing an opinion.

6. More comments (nearly 60%) are being filed by the newer (no/slow code) operators than the longer licensed fast code (i.e., 13 and 20 wpm) proficient.

Table I relates the license held by an amateur (either fast code—13/20 wpm; or no/slow code—0/5 wpm) to how he/she commented to the FCC. Note that the fast coders prefer either no change or a maximum of 12 wpm, while the no/slow coders prefer a maximum of 5 wpm. Overall, when all comments are considered, however, nearly half (46%) prefer a 5 wpm maximum code speed. Again, keep in mind that nearly 60% of all comments are being filed by those 0–5 wpm proficient. It clear-

Telegraphy Proposal	Fast Code (4)	No/slow Code (5)	Proficiency Unknown (6)	All
FCC (1)	36%	3%	26%	20%
ARRL (2)	31%	29%	15%	29%
VEC (3)	26%	64%	54%	46%
Unknown	7%	4%	5%	6%
Total	100%	100%	100%	100%

(1) = Favors no change in present telegraphy requirements.
(2) = Favors 5 wpm General, 12 wpm for Advanced and Extra.
(3) = Favors maximum speed of 5 wpm for all classes.
(4) Fast code licensee = General/Advanced/Extra Class.
(5) No/Slow code licensee = Novice/Technician/Tech Plus.
(6) Unknown proficiency = Unable to determine license class.

Note: This chart was prepared by feeding code preferences and license class of commenter into an Excel spread sheet. All comments were extracted from the FCC's Electronic Comment Filing System (ECFS), which is publicly available on the Internet.

Table I– Comments grouped by code proficiency.

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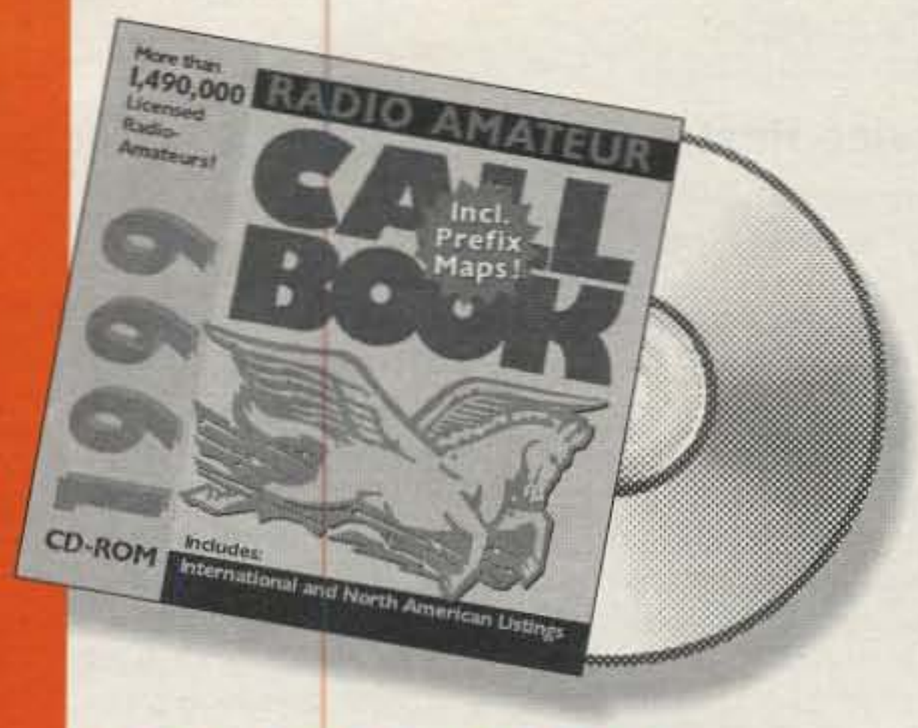

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ly shows that comments from the amateur community reflect their own personal situation.

Amateur Service Restructuring Comments

Hundreds of comments have already been filed electronically through the FCC's new Electronic Comment Filing System (ECFS). To determine what the Amateur community is saying about the Morse code, we randomly downloaded approximately 10% of those posted. Here is a sample of how the amateur community feels:

• We in the amateur community have long been forced to deal with unnecessarily complex level requirements and differences. This seems to have evolved due to the fear of change by existing licensees. An argument I hear from many is that passing code speed tests somehow proves one's operating skill. . . . I am convinced that code proficiency at sending and receiving Morse code *only* demonstrates one's ability to send and receive code and has no relationship to any other operating practices.—*Clarence Zickuhr, NL7SG, Anchorage, AK*

• I believe a single speed requirement of 5 wpm is sufficient for maintaining telegraphy proficiency in the Amateur Service. I believe that . . . CW telegraphy will continue to play a role in emergency communications. . . . when propagation conditions are poor, when equipment is simple, when nothing else will get through, CW makes the link possible.

. . . the ARRL proposal for Amateur Service restructuring suggests that the maximum CW speed requirement be 12 wpm. This does not seem consistent with continuing to restrict the bottom 25 kHz of the 80, 40, 20, and 15 meter [bands] for exclusive use of holders of the highest class license. . . . if the highest code speed one is required to attain is 12 wpm, the attainment of that code speed should provide one with full access to all CW sub-bands.—*James M. Floyd, Jr., W9KID*

• . . . if the Novice license is eliminated, the code speed requirement for the General Class license should be reduced to 5 wpm. I see the value of telegraphy not as a "filter" for potential licensees, not as a mode with much particular technical value in the 21st century. It is, however, a source of common social experience for amateurs, and so far has greatly contributed to the sense of identity, fraternity, and community that is most definitely a strength of the Amateur Service. It can still do so.

As to the issue of disability waivers, . . . what I suspect happens in some cases is that the physician, eager to help a patient and buried in an unimaginable pile of forms to sign, gives a perfunctory nod and signs off.—*William M. Klykylo, M.D., WA8FOZ*

• I am a member of the ARRL and an ARRL accredited VE. I am not in favor of nor do I support the proposal submitted by the ARRL . . .

I do support restructuring . . . as proposed by the FCC. . . I support keeping the telegraphy requirements unchanged. . . . when an individual has to work harder for something they tend to appreciate that something a little more and won't abuse it.

Another change which would improve the service would be to require radio amateurs seeking license renewal to retest and pass all exam elements required for their license class.—*Vincent Fiscus, KB7ADL*

• The ARRL has quietly lobbied a licensing restructuring proposal to the FCC, and intimated, falsely, its approval by the amateur community. All this was done without the knowledge and consent of the amateur radio community. The ARRL has no authority to speak, act, or initiate on my behalf. I am not an ARRL member. At no time have I authorized them or any other amateur radio entity to represent me in any way. They are only a membership club. Claiming to represent me directly or indirectly constitutes oppression and usurpation of my rights.

The ARRL is not entitled to favored status with the FCC, nor is any other group. This ARRL proposal has no approval by any majority, other than that of their own closed "board." Even their membership was given no chance to vote on it. The ARRL itself does not constitute a majority; less than 24% of amateur radio operators belong. The ARRL is selling the downgrading of licensing standards under the guise of "simpler structure." The benefits of amateur radio are already available to all people. As with any vocation or interest, there are standards which one must meet to secure a privilege.

The ARRL gives no justification for reducing telegraphy standards. Amateur radio relies on standards and the testing process to ensure quality. Stubbornness, laziness, or personal dislikes are not valid reasons within any avocation, such as aviation, medicine, or sports, to lower qualification or performance standards. CW testing is essential to the maintenance of quality of the Amateur Service, as it is based on learning by rote memorization and practice, actions that cannot be fabricated, thereby proving dedication and motive.

. . . Their proposal is not just a simplification of the licensing structure. It is a downgrading of licensing requirements. Further, the proposed four license classes are homogenized, insulting those who qualified under higher standards. I oppose any downgrading of licensing requirements, grandfathering of classes, or expansion of the phone subbands. Retain all present CW requirements at present test speeds.

The ARRL has tampered with the amateur licensing structure once before. It "solved" nothing. The "problems" concerning amateur radio were imaginary. This ARRL licensing restructuring proposal only serves ARRL pecuniary interests, not amateur radio.—*Raymond J. Laine, W0FRQ*

• Ignore the IARU (sic) Treaty as Japan does and do not test for any CW requirement. But if you determine that CW requirement is a must, the maximum speed for full HF access should be 5 wpm. Actually a speed of 1 wpm (yes, one!) would be quite adequate to meet the IARU requirements.

Although I am an ARRL member, I hold "no stock" in the survey they supposedly took on CW! I believe all amateurs (except the minority Extra Class) support the elimination or reduction of CW testing speeds to gain HF access.

I believe the ARS could be further "streamlined" by going to only two classes: Technician . . . a no-code class with full privileges above 30 MHz, and a General Class ticket which could be 5 wpm maximum (only if necessary!) and have all the privileges of the current Extra Class ticket.—*Keith R. Schreiber, W8KTH*

• I agree with the FCC's statement that non-hobby use of Morse code has declined in the past few years. Like many modes of transportation (such as the horse and buggy), Morse code has had its time and served us well, but now new modern modes have taken its place. Morse code's current use in amateur radio testing procedure is being used as purely a filter, partly because of tradition, and partly because of an unwarranted fear of opening the amateur ranks to the masses. A potential licensee who has trouble learning the code has to be very determined and work extremely hard to achieve the goal of passing the code test, for which he may never use again. . . . If the Commission feels it must, to satisfy our international agreement, make the requirement for all classes above Technician be five (5) words per minute. Although I think this would again be revisited after the ITU conference in 2001.—*Herbert W. Blair, Jr., K5IDX*

• Thought needs to be given to the appropriate "entry" level to the world of HF . . . The Novice is used to provide a way for a new ham to get on the ham bands and learn through experience how to operate a radio and communicate with other hams.

Turning a new ham loose on the lower 25 MHz of 20 meters would be similar to letting a new driver loose on the Washington, DC loop. The new hams will be intimidated and the seasoned hams will be annoyed.—*Richard E. Weingarten, NØSH*

• Without public input, the Federal Communications Commission has announced that it plans to . . . simplify its own oversight job. I ask that you keep the current Morse code requirements. The stupidication of America has to stop!—*Joseph D. Carvalho, KR6NBA*

• I've read the ARRL's proposal and am convinced that they are trying to boost membership under the guise of attracting more people into the service/hobby. It's also a safe bet that the equipment manufacturers would like to see the Morse code requirement vanish. Both of these are lousy reasons. CW is not intended to prevent anyone from obtaining HF privileges. It is a way to ensure that the operator is proficient in both the most popular operating modes, phone and CW.—*Eric Sonnenwald, N2XSE*

• Ham radio is a hobby. A means to learn and use new skills. Morse code is a skill. It is important for ham radio to maintain the old with the new. It is part of our heritage, and history. It should always be part of amateur radio. . . . It is absolutely important that the entry to the General license require passing a 13 word per minute Morse code test.—*Harvey L. Zion, Jr., K7VZ*

• Since the Amateur Radio Service is the last remaining entity to utilize [Morse code] in routine communications, I am convinced that it should be retained as a requirement for licensing at HF as currently required by international treaty so that a pool of trained code operators will exist. If this pool does not exist within amateur radio, it will not exist elsewhere.

It is entirely appropriate to reduce the skill requirement to 5 wpm for the General Class license and 12 wpm for the Advanced Class. . . . To encourage those amateur operators who wish to advance their code skills, the Extra Class license would retain the 20 wpm level exam.—*Richard S. Carroll, W0EX*

• Six classes of license are unnecessary and create needless amounts of paperwork (and expense) with no apparent advantage for either the FCC or the amateur community. Both parties would be well served by

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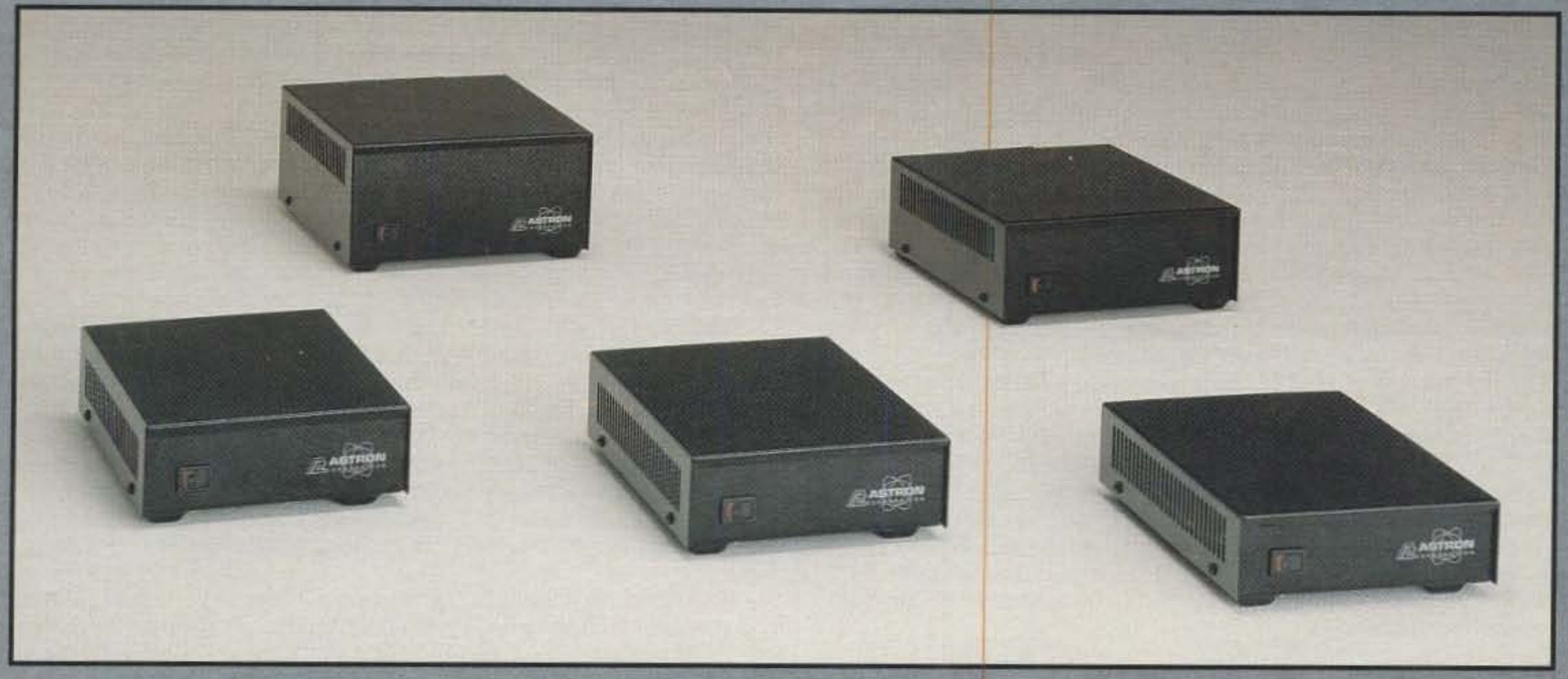

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SS-18	15	18	2.3 x 6 x 9	3.6
SS-25	20	25	2 7/8 x 7 x 9 3/8	4.2
SS-30	25	30	3 3/4 x 7 x 9 5/8	5
SS-25M*	20	25	2 7/8 x 7 x 9 3/8	4.2
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no more than three classes with limitation on power for the entry class and limited spectrum. . . . Advanced Class should automatically become highest class by a new name and permitted to act as VEs for all classes of applicants. . . . Morse code requirements are as obsolete as spark gap propagation. . . . Morse code beyond the most elementary level is meaningless.—*Ralph E. Herzler, W8SAT*

• Eventually phase out all code tests. For the present, lower the speeds. . . . None of the services now use Morse code in a world of modern computer communication.—*Russell M. Lockett, WA3IBE*

• I am an electrical engineer working as a digital designer. I feel that the Morse code requirement has outlived its usefulness and should be abolished or greatly reduced. I passed the 5 wpm code and found I have no interest in using the code at all. It is antiquated and should fall by the wayside as did AM when SSB came on the scene. Those who want to can still use Morse code, but it should not be a stumbling block to use of the HF frequencies. I am greatly interested in using the HF frequencies for SSB, but cannot as current licensing exists.—*John W. Bunker, N7RSP*

• The days of needing Morse code as a reliable means of communications have been superceded by other means: satellite, digital, microwave; and with the advent of high speed computers and modems, even the Internet. This is not to say that use of CW as an approved mode should be eliminated; rather it should be allowed for those who choose to use it, for whatever reason. Years ago, the CW requirement was utilized to keep troublemakers out of the amateur ranks. Has it effectively done this? Given the amount of problems on 75 meters and other HF bands, the answer is an unequivocal, "No!."—*Robert E. Williams, KB7BVL*

• Let me make it clear: I do not oppose the continued use of Morse code on the amateur bands, only the code testing requirement. If the code requirement were abolished, I personally would use Morse code. However, instead of using a key I would use a computer to send and receive.

I believe if the code requirement were abolished you would find many amateur radio operators like myself who would use code, albeit through computers.—*Clay Redden, KC4YAU*

• I believe the major reason that we are not seeing more General, Advanced, and Extra Class upgrades is the Morse code requirement. It takes a lot of work to master 13 or 20 wpm. Personally, I have never been able to devote the time to master 20 wpm for the Extra Class. . . . Lower the Morse code requirement to 5 wpm for all HF privileges.—*Claude C. Held II, WA9KCU*

• I strongly believe that the CW portions of all HF/VHF/UHF bands be relisted as both CW and phone in each class [which will] afford greater bandwidth to all as phone doesn't much hurt CW . . .—*Albert Redles, N3JCD*

• The testing should be about Morse, such as "What does the Morse character • — (didah) stand for?" That is the way the other modes are handled. But because of the international Radio Regulations, I would say that a Morse code test of 5 wpm for the General Class license would be acceptable. This test would be either multiple choice or one minute of "understandable" copy. There would be no other speed tests required for the other license classes. In place of Morse code, there should be more emphasis on technology.—*Michael J. Metzdorf, KB9NZV*

• I believe that manual transmission and reception of telegraphy is an anachronism—similar to a slide rule. Engineering schools no longer teach operation of a slide rule as it is irrelevant in today's scientific environment. . . . I propose that the FCC reduce the code requirement to 5 wpm for all classes of amateur license.—*Jim Phillips, KB6OKH*

• Amateur radio is rapidly becoming extinct as new forms of communications are being developed. It is important to keep the hobby alive by letting people have access to this great pastime.—*Irwin S. Goldstein, Niles, IL*

• New hams are the lifeblood and future of our hobby. . . . While Morse code requirements may have once been legitimate, they are no longer so. . . . Morse code requirements are worse than antiquated. They are counter productive to reaching a generation raised on the Internet and with computers. Until the next ITU convention, the only Morse code test should be 5 words per minute.—*Ed Griffith, KC6WCT*

• In 45 years, I have made possibly a half dozen CW contacts. I have viewed the code requirements as a way to keep persons out of ham radio. This was not so serious for the hobby until PCs, e-mail, and cell phones became available. These new ways of communicating which do not require some arduous/meaningless testing to get a license provide an attractive alternative to ham radio.

The result is that the number of new hams is in a serious decline. What I hear is that young folks do not want to spend a lot of time on code they never expect to use.

The design of the licensing process should be to reward technical achievement, not code proficiency. Like cat whiskers for crystal radios, CW should be buried along with other historic relics of ham radio.—*Tommy F. McCraw, K3KGF*

• I believe it is a severe imposition on amateur radio operators to reduce the licensing requirements for newcomers, only to swell the amateur ranks. . . . Yet something has to be implemented to encourage the younger generation in this avocation, less it falter. . . . The sorry mess that developed when the FCC abandoned the licensing of Citizen's Banders must be avoided and I would despise the thought of that happening to amateur radio. . . . Our youth are taking to the World Wide Web rather than studying the code.—*Harlan H. Benoy, KO6WF*

• I think that Morse code proficiency is an antiquated and outdated requirement for the licensing of amateur radio operators of any class. It is no longer objectively necessary for any purpose. Its only function is to keep people out of amateur radio.—*Laird Wilcox, KBØRDL*

• I favor three levels of CW exam: 5, 12, and 20/25 wpm. The 5 wpm will help secure an influx of new operators in the HF portions of the Amateur Service. Twelve wpm (instead of 13 wpm) will bring the Advanced Class into alignment with the Europeans under CEPT. A 25 wpm plain language, 20 wpm coded groups requirement using the existing First Class Radiotelegraph license code elements would give status to the Extra Class license that it now sorely lacks. At some future point, the code requirements for this license class should be increased to 30/25 wpm or greater.—*Warren T. Reese, WB6TMY*

• The future of amateur radio in the United States depends upon attracting youngsters who have grown up using computers. How do we rationalize requiring these youngsters to memorize a 19th century code as we enter the 21st century? It is imperative that the FCC remove the "barrier" of an outdated telegraphy requirement from its Rules and Regulations.—*Don Delarnette, KC4YRT*

• As a Extra Class ham operator, I oppose the new proposal that would reduce the code speed for all license classes in our hobby. I am con-

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cerned that the "dumbing down" of our hobby will attract people that are not committed and amateur radio will end [up] a "useless wasteland" like CB radio became. I am not opposed to the restructuring of licenses as long as the code speed is not reduced for access to the HF ham bands. I had to work very hard to achieve the 20 wpm.—*Fernando Ares, KE9LE*

• I spend about 90% of my operating time on CW. . . . I look at CW as an accepted international language, not a dinosaur. Let us look toward the future of the hobby, but preserve this art, or language, of communication.—*Marty Szumera, WM2DX*

• A strong and vital Amateur Radio Service is an important asset to the nation, fulfilling not only the well-known functions outlined in its regulatory charter, but also increasingly-important educational functions for a society growing more technological by the year. To do this, the service must grow and overcome an alarming trend toward stagnation evident in recent years.

That stagnation, evidenced by an increasingly "bottom heavy" distribution of licenses, is due in large part to the current licensing structure, and particularly to the significant barrier presented by the 13 wpm code requirement—*David G. Finley, N1IRZ*

• Morse code (CW) transmission remains an important part of HF and Amateur Radio Service operations. CW emissions require less bandwidth than most other transmission methods, and can be received from greater distances. Distance contesting, a popular amateur activity, makes extensive use of CW emissions. For long-distance transmissions, CW may be unparalleled. . . . retain the current levels of required Morse code proficiency.—*Frederick E. Patton, San Jose, CA*

• I agree that the present requirements for Morse code proficiency should be reduced and that a more rigorous electronics exam take its place. The United States would certainly benefit from more ham operators having an improved electronics knowledge. But how does the present requirement of code proficiency benefit anyone except those who want the HF ham bands all to themselves? Please change these regulations!—*Charles Kitchin, N1TEV*

• Today, Morse code is merely one of the many modes of communication used by amateur radio operators. There is no reason to single it out as particularly significant or important. A single 5 wpm Morse test will also remove the necessity of processing and issuing waivers of high-speed code tests for the handicapped. Eventually, all Morse testing should be eliminated consistent with our obligations under international treaties.—*James L. Kelly, KK3K*

• The Extra Class sub-bands are highly valued by amateurs involved in long-distance "DX" communications. . . . Since access to these telegraphy sub-bands is the primary benefit of upgrading to Extra Class, and since examination requirements should correlate to privileges earned, it is appropriate that the Extra Class code test be very challenging. Therefore, I strongly urge the Commission to keep the 20 wpm Extra Class code requirement.—*Arthur P. Harris, N2AH*

• I likely would continue to support the Morse requirement even if in 2001 WRC decided to delete this requirement. However, I do not support a proficiency that eliminates or keeps out those who cannot provide increased code speed. . . . If 5 wpm fulfills the requirement of the International Radio Regulations, Article S25, then why not leave the speed at 5 wpm?—*William H. Skinner, WA2ILF*

• The need to demonstrate [cw proficiency] is long past. The level of competency should be no more than basic, and that too is questionable. . . . Let's face facts: Most of the so called "no-code Techs" are as knowledgeable of state-of-the-art operating modes and techniques (or in many cases, more knowledgeable) than many "old timers" with great CW skills. Why should a hobby be so restricted that we exclude them?—*Frederick K. Walters, Jr., WB5CBD*

• I have concluded that the single greatest obstacle to continued participation in HF amateur radio is the 13 word-per-minute General Class CW exam. . . . Many thousands of otherwise qualified Technician Plus operators have demonstrated an interest in HF voice and data communications, but in reality, few have a desire to use Morse code telegraphy. Forcing this group to attain such a high, 13 wpm level of proficiency in CW is unreasonable and dispiriting.—*Michael Borowiec, N9EUZ*

• In today's world of digital communications technology, can anyone make a serious argument that we must have some mythical pool of code trained operators for civil order or national security? Why then should a hobby, albeit a hobby that enjoys the privilege of using the airways, be so restrictive that it actually discourages many persons from venturing into it?

Those "old timers" who have successfully reached the General or Advanced level may defend the need for code by arguing, "I had to pass through those gates to get to the privileges I now enjoy, so let others do it," are in effect saying, "Let this be a hobby of elitists."—*Roger Eldon Hammond, KB9IHP* ■

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PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

CQ WW SSB Contest Weekend the Best in More Than Five Years

Extensive geomagnetic, solar, and ionospheric data evaluated by early November confirms that despite an unexpected drop in the daily sunspot count during the SSB Contest weekend, good, generally stable HF propagation conditions were observed. A solar flux count above 140 and a corresponding daily sunspot number of approximately 100 were expected, but on October 24th the observed solar flux was only 111 and the sunspot number was 39. On October 25th the flux dropped to 108 and the sunspot number to 29. Table I shows the worldwide Kp index of geomagnetic activity for both contest days.

Table II shows general ratings of propagation conditions observed both days in various geographical areas of the world. Geomagnetic and ionospheric conditions were mainly Low Normal, with periods of High Normal for openings to mid, lower, and equatorial areas. Some periods of Below Normal conditions were reported on trans-auroral paths to northern Europe and the Far East. Early reports from contest participants rated the weekend conditions as the best experienced during any CQ WW DX SSB Contest period for at least the past five years, particularly on the 20, 15, and 10 meter bands.

Sunspot Cycle 23 Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 93 for September 1998. The high for the month was 138, reached on September 22nd, and the low was 41, recorded on the 30th. September's mean value results in a smoothed running sunspot number of 54 centered on March 1998. This is an increase of five from the previous month's level. A smoothed sunspot level of approximately 112 is forecast for January 1999.

Canada's Dominion Radio Astrophysical Observatory in Penticton, B.C. reports a corresponding mean 10.7 cm solar flux level of 139 for September 1998. This results in a smoothed level of 108 centered on March 1997. A level of approximately 133 is forecast for January 1999.

1999 Looks Like A Bonanza Year

Cycle 23 is now in its third year, and it is expected to rise rapidly during 1999, entering its Intense Phase. According to scientists at the National Geophysical Data Center (NOAA) in Boulder, Colorado, the new year is expected to begin at a smoothed sunspot level of approximately 112, and the cycle is expected to rise to approximately 153 by the year's end.

Table III shows the progress of Cycle 23, with predictions for 1999. The cycle is predicted to be among the most intense recorded, and it is expected to reach its peak sometime between early and mid-2000 with a value ranging between 155 and 170. If Cycle 23 exceeds a level of 165, it will be at least the second most intense cycle recorded. The most intense was Cycle 19, which reached a record peak of 201 in March 1958.

This means that HF propagation conditions during 1999 may be better than they have been for the past 40 years. The new year is certainly one for radio amateurs and other users of the HF spectrum to look forward to for unusually good propagation conditions from 160 through 6 meters. What a great way to end the century!

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 1999

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 2, 4, 15, 18, 20, 29, 31	A	A	B	C
High Normal: 3, 5, 14, 17, 19, 21, 25-27, 30	A	B	C	C-D
Low Normal: 1, 6, 9-13, 16, 23-24, 28	B	C-B	C-D	D-E
Below Normal: 8, 22	C	C-D	D-E	E
Disturbed: 7	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading and noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of (3) will be fair to good (C-B) on January 1st, excellent (A) on the 2nd, good (B) on the 3rd, excellent (A) on the 4th, good (B) on the 5th, etc.

Total Solar Eclipse

The new year will also be marked by another scientific event of interest to many radio amateurs. A total eclipse of the sun will occur on Wednesday, August 11. The eclipse will be visible in a narrow zone from the Atlantic Ocean onwards, over western and central Europe, toward the Middle East and India. During a total eclipse a brief period of darkness occurs when the sun's disk is totally covered by the moon. For a short period during the day the brightest stars, as well as the outer gaseous layers of the sun's corona, can be seen. During this period, radiation from the sun is blocked by the moon, resulting in a much weakened ionosphere.

1999 HF Propagation: The Best May Be At Hand

Following is a thumb-nail sketch of propagation conditions expected during 1999 on each amateur band between 6 and 160 meters.

6 meters: *F-2* layer ionospheric DX openings are very likely during daylight hours of 1999, particularly during the winter and equinox months. Improved short-skip openings are expected during the sporadic-*E* summer season.

10 meters: This should be a great year for 10 meters. Expect an increasing number of DX openings for longer periods of time during the daylight hours, especially

Planetary Kp Index	UT 00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24
Oct. 24	3	4*	3	2	2	2	3	3
Oct. 25	3	4*	4*	3	3	3	2	2

Table I– Worldwide geomagnetic indices (planetary Kp) reported every three hours during the SSB Contest weekend of October 24–25. (*) Indicates minor storminess and Below Normal HF conditions. All other values indicate quiet, stable, non-storm geomagnetic conditions with (3) Low Normal and (2) High Normal.

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Say You Saw It In CQ

Geographical Areas	October 24	October 25
Polar	Low Normal	Low Normal
Auroral	Below/Low Normal	Below/Low Normal
Middle Latitude	Low Normal	Low Normal
Low Latitude	Low/High Normal	High Normal
Equatorial	High Normal	High/Above Normal
10.7 cm Radio Flux	111	108
Daily Sunspot Number	39	29
WW Geomagnetic Ap Index	13	16
WW Geomagnetic Kp Index	2.8	3.0

Table II– Summary of HF propagation conditions based on reports made jointly by USAF and NOAA during the CQ WW DX SSB Contest weekend of October 24–25 and upon initial reports from contest participants.

during the equinox and winter months. DX openings to many areas of the world should also be possible during the summer months, sometimes lasting well into the early evening hours. Expect improved short-skip openings during the summer sporadic-*E* season.

12 meters: Should behave very much like the 10 meter band, but open somewhat more frequently to more areas of the world and remain open for an hour or two longer.

15 meters: This may very likely be the optimum DX band in 1999 for worldwide openings during the daylight hours of all seasons. Expect the band to remain open well into the evening hours, particularly during the summer months.

17 meters: Should behave much like 15 meters, but open more often and remain open for DX an hour or two longer.

20 meters: Always a great band, it is in its prime during peak solar activity. Excellent conditions are expected on this band during the hours of daylight, with worldwide DX openings possible throughout the year. DX conditions on this band tend to peak for a few hours after local sunrise, and again during the sunset period. During the summer months expect this band to remain open for DX well past midnight, and often throughout the entire period of darkness. In the winter months of 1999 increased nighttime DX openings are also expected. Twenty meters may well edge out 15 meters as the best all-around DX band during the new year.

30, 40, 80, and 160 meters: These are basically nighttime DX bands. Exceptionally good worldwide DX should continue on 30 and 40 meters from about two hours before sunset to approximately two hours after sunrise during all seasons, and on 80 and 160 meters during the equinox and winter months.

January Conditions

It should be a toss-up among 10, 12, and 15 meters for DX propagation honors during the daylight hours. These bands should open to most areas of the world, often with very strong signals. Ten meters may have a slight edge before noon, with 12 and 15 meters being somewhat better after noon and becoming the optimum DX bands during the late afternoon hours. Short-skip openings, between distances of approximately 1200 and 2300 miles, should be excellent on 10 meters during most of the daylight hours. Excellent short-skip openings are also expected on 12, 15, and 17

Month	1996	1997	1998	1999
Jan.		11	44	112
Feb.		11	49	116
Mar.		14	54	120
Apr.		17	*59*	*126*
May	8*	18	*64*	*131*
June	9	20	*70*	*136*
July	9	23	*77*	*140*
Aug.	8	25	*84*	*142*
Sept.	9	28	*91*	*144*
Oct.	9**	32	*98*	*148*
Nov.	10	35	*103*	*151*
Dec.	11	39	*108*	*153*

Table III– Observed mean smoothed sunspot numbers for sunspot Cycle 23 and predicted levels expected through 1999, based on data provided by the National Geophysical Data Center (NGDC), Boulder. A (*) indicates Cycle 23's mathematical beginning; a (**) marks the beginning according to a consensus of scientists. Numbers in italics are predicted values.

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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates possible 10 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. In the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last-Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *daylight* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EDT, on a circuit between New York and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone; and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 PM in Los Angeles; 18 or 6 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone; and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
January & February 1999
Local Standard Time At
Path Mid-Point (24-Hour Time)

Band (Meters)	*50-250*	*250-750*	*750-1300*	*1300-2300*
10	Nil	Nil	07-08 (0-1)	07-08 (1)
			08-09 (0-2)	08-09 (2-3)
			09-10 (0-3)	09-10 (3-4)
			10-12 (0-4)	10-12 (4)
			12-15 (0-3)	12-15 (3-4)
			15-17 (0-2)	15-16 (2-4)
			17-18 (0-1)	16-17 (2-4)
				17-18 (1-3)
				18-19(0-3)
				19-20(1-2)
				20-21(0-1)
15	Nil	07-08 (0-1)	06-07 (0-1)	06-07 (1)
		08-10 (0-2)	07-08 (1-3)	07-08 (3-2)
		10-15 (0-3)	08-10 (2-4)	08-18 (4)
		15-17 (0-2)	10-15 (3-4)	18-19 (3)
		17-18(0-1)	15-17 (2-4)	19-21 (1-3)
			17-18 (1-4)	21-23 (0-1)
			18-19 (0-3)	
			19-21 (0-1)	
20	09-11 (1-2)	06-07 (0-2)	06-07 (2-3)	06-07 (3-2)
	11-14 (1-3)	07-09 (0-3)	07-08 (3)	07-08 (3)
	14-15 (1-2)	09-11 (2-4)	08-09 (3-4)	08-12 (4)
	15-17(0-1)	11-14 (3-4)	09-17 (4)	12-14 (4-3)
		14-15 (2-4)	17-19 (3-4)	14-21 (4)
		15-17 (1-4)	19-20 (2-4)	21-23 (3-4)
		17-19 (0-3)	20-21 (1-4)	23-01 (2-3)
		19-20 (0-2)	21-23 (1-3)	01-04 (1-2)
		20-06 (0-1)	23-02 (1-2)	04-06 (1)
			02-06 (1)	
40	07-08 (0-2)	07-08 (2-3)	07-08 (3)	07-08 (3-1)
	08-09 (1-3)	08-09 (3)	08-09 (3-2)	08-15 (1-0)
	09-10 (2-4)	09-11 (4-3)	09-11 (3-1)	15-17 (2-1)
	10-19 (4)	11-15 (4-2)	15-17 (4-2)	17-18 (3)
	19-21 (2-3)	15-19 (4)	17-18 (4-3)	18-06 (4)
	21-00 (1-2)	21-00 (2-4)	18-00 (4)	06-07 (4-3)
	00-07 (0-1)	00-02 (1-3)	00-02 (3-4)	
		02-06 (1-2)	02-06 (2-4)	
		06-07 (1-3)	06-07 (3-4)	
80	07-08 (2-4)	07-08 (4-3)	07-08 (3-1)	07-08 (1-0)
	08-10 (4)	08-09 (4-2)	08-09 (2-0)	08-16 (0)
	10-15 (4-3)	09-10 (4-1)	09-16 (1-0)	16-18 (1-0)
	15-00 (4)	10-15 (3-1)	16-18 (2-1)	18-20 (3-2)
	00-04 (3-4)	15-16 (4-1)	18-20 (4-3)	20-04 (4)
	04-07 (2-3)	16-18 (4-2)	20-06 (4)	04-06 (4-3)
		18-04 (4)	06-07 (4-3)	06-07 (3-1)
		04-07 (3-4)		
160	09-17 (1-0)	17-18 (2-1)	17-18 (1-0)	18-19 (1-0)
	17-19 (3-2)	18-19 (2)	18-19 (2-1)	19-21 (2-1)
	19-06 (4)	19-21 (4-3)	19-21 (3-2)	21-03 (3)
		06-08 (3)	21-05 (4)	21-03 (4-3)	03-05 (4-2)
		08-09 (2-1)	05-06 (3)	03-05 (4)	05-06 (2-1)
			06-07 (3-2)	05-06 (3-2)	06-07 (1-0)
			07-08 (3-1)	06-07 (2-1)	
			08-09 (1-0)	07-08 (1-0)	

ALASKA
November & December 1999
Openings Given in GMT#

10 To:	*15 Meters*	*20 Meters*	*40/80 Meters*	*Meters*
Eastern USA	17-18 (1)	15-16 (1)	12-16 (1)	06-12 (1)
	18-20 (2)	16-17 (2)	16-18 (2)	07-11 (1)*
	20-22 (3)	17-21 (3)	18-21 (1)	
	22-00 (2)	21-23 (4)	21-23 (2)	
	00-01 (1)	23-00 (3)	23-02 (3)	
		00-01 (2)	02-03 (2)	
		01-02 (1)	03-05 (1)	
Central USA	17-18 (1)	15-16 (1)	12-16 (1)	06-08 (1)
	18-20 (2)	16-17 (2)	16-18 (2)	08-13 (2)
	20-00 (3)	17-20 (3)	18-20 (1)	13-14 (1)
	00-01 (2)	20-23 (4)	20-22 (2)	07-12 (1)*
	01-02 (1)	23-01 (3)	22-00 (3)	
		01-02 (2)	00-02 (4)	
		02-03 (1)	02-03 (3)	
			03-04 (2)	
			04-06 (1)	
Western USA	18-19 (1)	16-17 (1)	12-16 (1)	04-05 (1)
	19-20 (2)	17-18 (2)	16-18 (2)	05-06 (2)
	20-21 (3)	18-20 (3)	18-22 (3)	06-14 (3)
	21-23 (4)	20-01 (4)	22-02 (4)	14-15 (2)
	23-00 (3)	01-02 (3)	02-04 (3)	15-16 (1)
	00-01 (2)	02-03 (2)	04-05 (2)	05-10 (1)*
	01-02 (1)	03-04 (1)	05-07 (1)	10-14 (2)*
				14-15 (1)*

HAWAII
November & December 1999
Openings Given in
Hawaiian Standard Time#

10 To:	*15 Meters*	*20 Meters*	*40/80 Meters*	*Meters*
Eastern USA	07-08 (1)	06-07 (1)	12-14 (2)	17-18 (1)
	08-09 (2)	07-09 (4)	14-17 (4)	18-20 (2)
	09-13 (4)	09-12 (3)	17-21 (3)	20-02 (3)
	13-14 (3)	12-15 (4)	21-00 (2)	02-03 (2)
	14-15 (2)	15-17 (3)	00-06 (1)	03-04 (1)
	15-16 (1)	17-18 (2)	06-08 (3)	19-20 (1)*
		18-19 (1)	08-09 (2)	20-01 (2)*
			09-12 (1)	01-03 (1)*
Central USA	07-08 (1)	06-07 (1)	08-13 (2)	17-18 (1)
	08-09 (2)	07-09 (4)	13-14 (3)	18-20 (2)
	09-15 (4)	09-13 (3)	14-20 (4)	20-21 (3)
	15-16 (3)	13-17 (4)	20-00 (3)	21-01 (4)
	16-17 (2)	17-19 (3)	00-02 (2)	01-03 (3)
	17-18 (1)	19-20 (2)	02-05 (1)	03-04 (2)
		20-21 (1)	05-06 (2)	04-06 (1)
			06-08 (3)	19-20 (1)*
				20-22 (2)*
				22-01 (3)*
				01-03 (2)*
				03-05 (1)*
Western USA	07-08 (1)	06-07 (1)	08-10 (4)	17-18 (1)
	08-09 (2)	07-08 (2)	10-15 (3)	18-19 (2)
	09-16 (4)	08-12 (3)	15-22 (4)	19-20 (3)
	16-17 (3)	12-18 (4)	22-01 (3)	20-03 (4)
	17-18 (2)	18-20 (3)	01-04 (2)	03-05 (3)
	18-19 (1)	20-21 (2)	04-06 (1)	05-06 (2)
		21-22 (1)	06-08 (3)	06-07 (1)
				19-20 (1)*
				20-21 (2)*
				21-04 (3)*
				04-05 (2)*
				05-06 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.
* Indicates best time to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
Check for 6 meter openings at times when the 10 meter forecast rating is shown as (4).
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances use the preceding Short-Skip Chart.

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meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles.

Excellent propagation conditions are expected on 20 meters for both DX and short-skip openings almost around the clock. DX conditions should peak during a window of an hour or two following sunrise, and again during the late afternoon and early evening hours. On many days the band should remain open well past midnight. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Openings to most areas of the world are forecast from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours short-skip conditions should be optimum for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimum for openings between 800 and 2300 miles.

Atmospheric noise levels are expected to be at seasonally minimum levels in the northern hemisphere during January. This should result in peak conditions on both the 80 and 160 meter bands. Expect some good openings to many parts of the world on 80 meters during the hours of darkness and the sunrise period. Short-skip openings, between distances of 50 and 250 miles, should be optimum on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the 160 meter band during the hours of darkness. Openings towards Europe and the east should peak at about midnight.

Openings towards the South Pacific and in a generally southerly direction should peak just prior to daybreak. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours, intense solar absorption will severely limit openings, although some may be possible at times up to 150 miles or so.

Short-Skip Charts

This month's column contains a Short-Skip Propagation Chart for use in the continental United States for distances between 50 and 2300 miles. Prediction charts centered on Hawaii and Alaska are also included. These charts are valid through February 1999. See last month's column for detailed DX Propagation Charts for use during January.

VHF Ionospheric Openings

Solar activity is expected to be high enough during January to permit some good DX openings on 6 meters to many areas of the world. Look for peak conditions towards Europe and Africa an hour or two before noon and towards the Caribbean area and Central and South America from an hour or two before, to about an hour or two after, noon. Look for possible 6 meter openings towards the Pacific, Australasia, and possibly the Far East during the later afternoon hours. Trans-continental openings should be possible beginning at about noon. Chances are best for 6 meter openings on those days expected to be High or Above Normal. (See the Last-Minute Forecast at the beginning of this column.)

Chances for meteor-scatter VHF openings should be pretty good between January 2nd and 4th, coincident with the occurrence of the *Quadrantids* meteor shower. This is expected to be a major shower, which should peak on January 3rd with a count of approximately 40 meteors an hour.

Some auroral-type openings should be possible during January. Fairly widespread auroral activity can occur during the month when HF conditions are Below Normal or Disturbed. Check the Last-Minute Forecast for appropriate dates.

Not many trans-equatorial (TE) openings are expected this month, since a seasonal slump usually occurs during January. Some infrequent openings may be possible, however, between southern tier states and countries well south of the equator in this hemisphere. The best time to check for TE openings on 6 meters is between 7 and 10 PM local time.

Propagation conditions on the HF bands should be off to a good start during January, and they are expected to remain at an exceptionally high level throughout the New Year.

73, George, W3ASK

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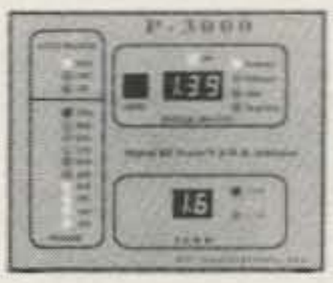

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Dual Band Handheld,
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2m Mobile **FT-2500M**

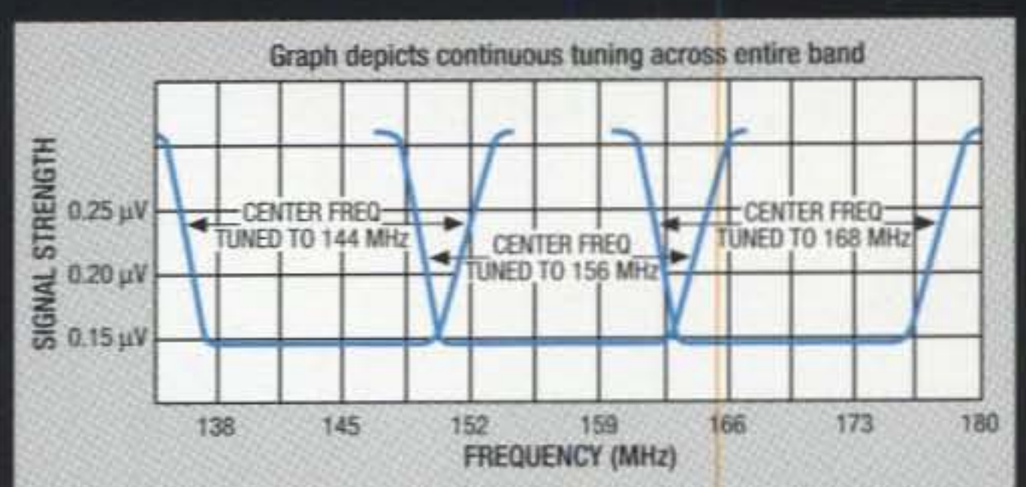
Advanced Track Tuning, Mil Spec, true FM. All in one radio!

Outside, you can easily see why the FT-2500M stands up to the shock and vibration like no other. We engineered the first mobile radio to meet the rigid standards set by the U.S. Military back in the '80s, and that same critical design is in the FT-2500M. From the simplified front panel, rubber coated knobs, durable pebbled finish coating, and huge Omni-Glow™ display to the one-piece die-cast chassis, the FT-2500M can take whatever you throw at it!

Inside, the electrical circuitry meets standards so uncompromising the FT-2500M can respond like no other radio. Built-in 3-Stage Advance Track Tuning (ATT), automatically retunes from 140 to 174 MHz permitting consistent receiver sensitivity across the entire band.

But there's more. Like alpha-numeric display capability! Lets you program a frequency or a 4-character name on any of the 31 memories. With three selectable power output levels and up to 50 watt power output, the FT-2500M extra large heat sink means forced air cooling is not necessary. And, as a bonus, Yaesu's exclusive backlit DTMF mic comes with every FT-2500M.

Experts say the FT-2500M is the only commercial-grade amateur radio available. So, for tough manufacturing standards, inside and out, with true FM clarity, and outstanding performance, the FT-2500M is your mobile.



3-Stage Advance Track Tuning (ATT) – The exclusive 3-Stage Advance Track tuning front end automatically adjusts band width sensitivity across the entire receiver range, while maintaining selectivity specifications. ATT significantly reduces interference from inter-modulation and front end overload.

Specifications

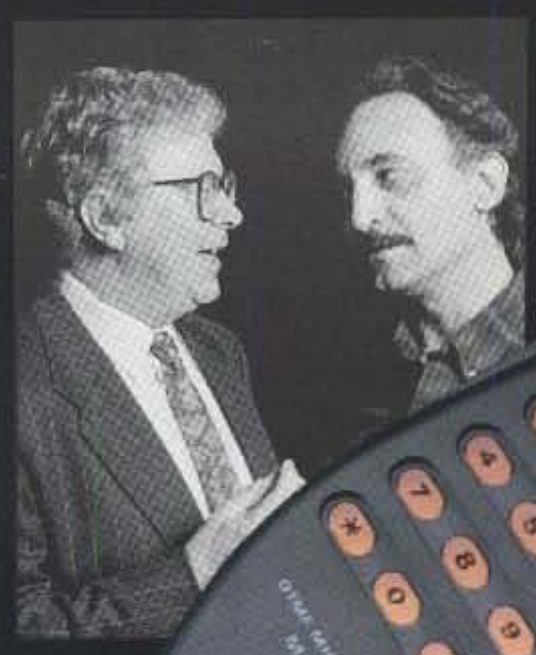
- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Omni-Glow™ Display, largest available
- Power Output:
  FT-2500M 50/20/5 Watts
- Flip Up Front Control Panel hides seldom used buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FP-1023	23 Amp HD Power Supply
FRC-6	DTMF Paging Unit
FTS-17A	CTCSS Decode Unit
SP-4	External Mobile Speaker w/ Audio Filters

*FT-2500M

YAESU

Performance without compromise.℠



"Just look inside. Military spec really means something to Yaesu!"

"A QST review says 'the FT-2500M exhibited superior 10 MHz offset IMD dynamic range of 103 db!' "

"This Advanced Track Tuning practically eliminates intermod!"

"Yaesu did it again."

FT-3000M

High-Powered 2-m FM Transceiver
Feature-rich, 70 full watts of TX power, and built to the tough performance standards you've come to expect from Yaesu.
FEATURES • Frequency Coverage Wide Band Receive-- RX:110-180 MHz, 300-520 MHz, 800-999 MHz* TX:144-148 MHz • AM Aircraft Receive • MIL-STD 810 Rating • Interactive Programming • High Power Output: 70 Watts, plus 50, 25 and 10 Watts • Quick-Touch™ Dual Concentric Control Knob • Twin Cooling Fans • ADMS-2 Windows™ Programmable • Digital Coded Squelch (DCS) • 81 Memory Channels • Auto Range Transpond System™ (ARTS™) • 1200/9600 Baud Packet Compatible • Smart-Search™ • Alphanumeric Display • Dual Watch • Full line of accessories
*800 MHz Cellular blocked

US MILITARY APPROVED MIL-SPEC 810

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Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

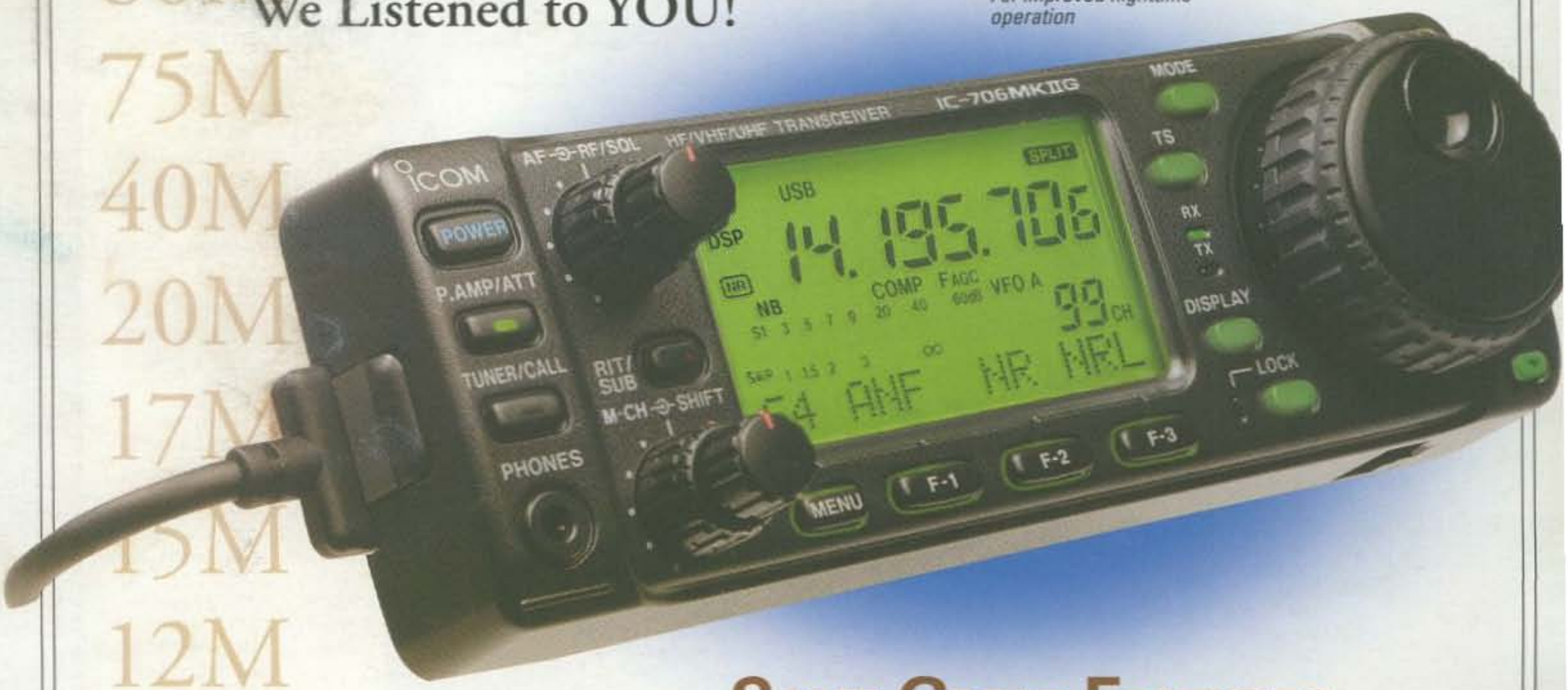
ICOM IC-706MKIIG

160M 80M 75M 40M 20M 17M 15M 12M 10M 6M 2M 70CM

How Could We Make the BEST even BETTER? We Listened to YOU!

HF/6M/2M/440 MHz
Worldwide or around the town, the new '706MKIIG has the power and features to take you there

Backlit Keys
For improved nighttime operation



Yes, You CAN Take It With You
Faceplate shown in optional Remote Control configuration. Requires OPC-581 11 ft. (3.5 m) or OPC-587 16 ft. (5 m) separation cable

In The Trunk, Under The Seat, or Under The Dash
The '706MKIIG is very compact. It measures only 6.6 (w) x 2.3 (h) x 7.9 (d) in /167 (w) x 58 (h) x 200 (d) cm. It's a mobile sized rig with base station capabilities

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- **MORE Power**
- **440 MHz Added**
- **MORE *FUN!***

- Tone Squelch (CTCSS decode)
- Auto Repeater Function
- DSP Included • Backlit Keys
- 50W on 2 M • 20W on 440 MHz

ICOM options required for PC operation:
CT-17 Level Converter
OPC-478 Connection Cable
Third party software also required for PC operation

PC Ready!

Join the thousands of hams who use ICOM's 706 series radios. Contact your authorized ICOM dealer today, or call ICOM for a free brochure, day or night. **425-450-6088**

*This device has not been approved by the Federal Communications Commission. This device may not be sold or leased, or be offered for sale or lease, until approval of the FCC has been obtained.

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